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The Mining Journal

LONDON, FEBRUARY 26, 1960


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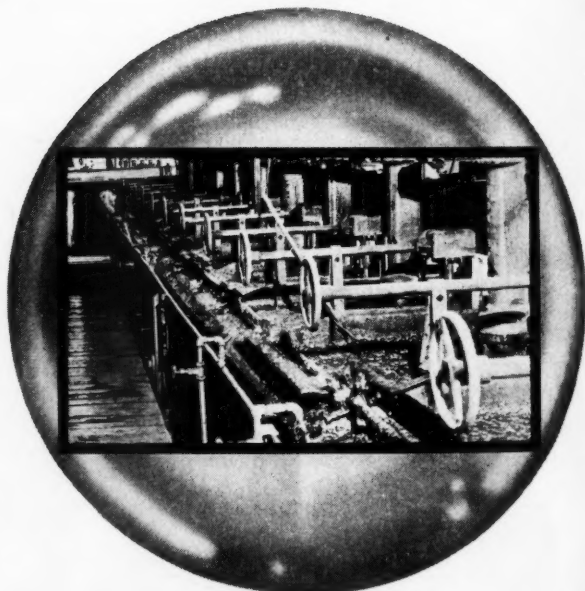


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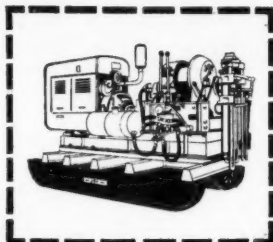
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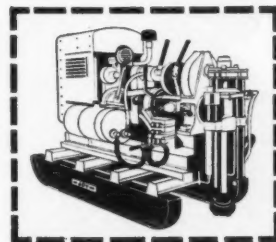


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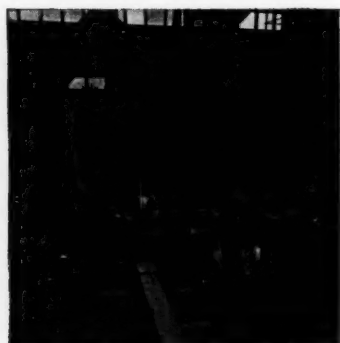
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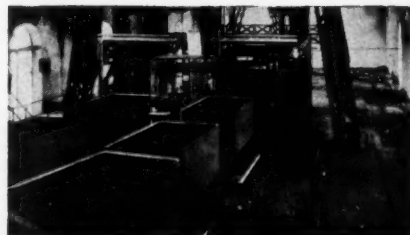
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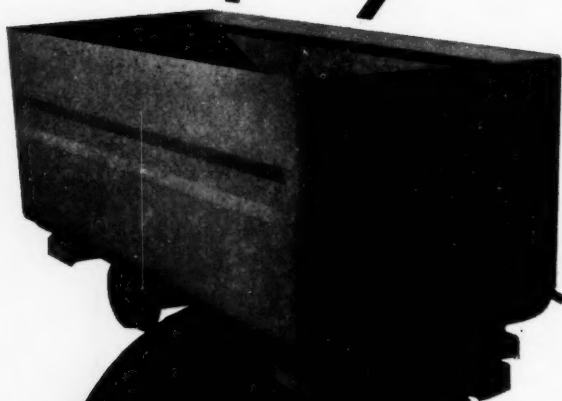
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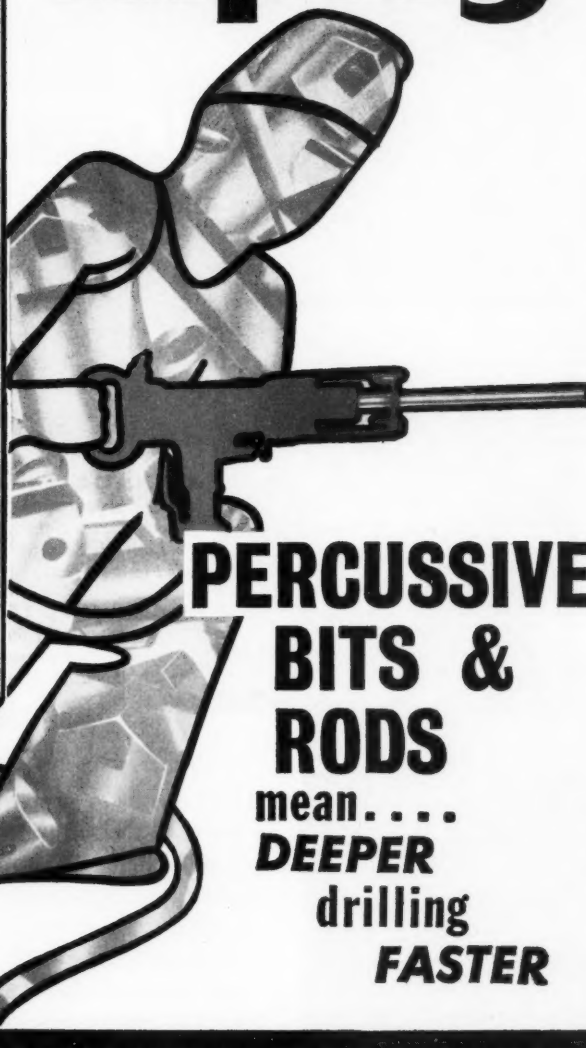
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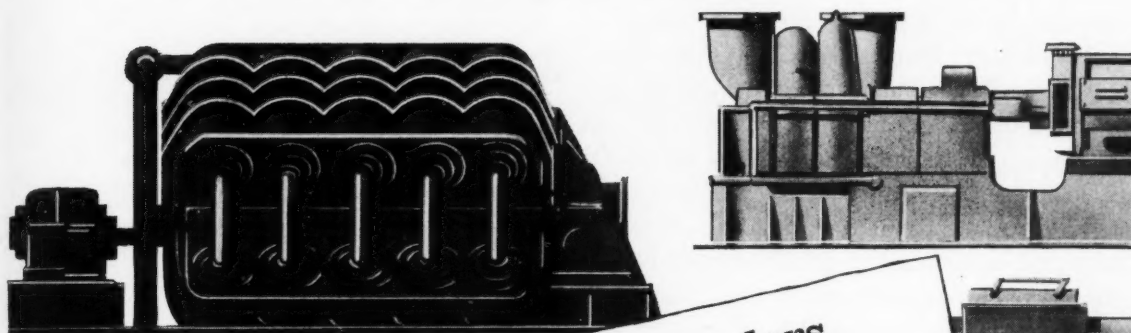
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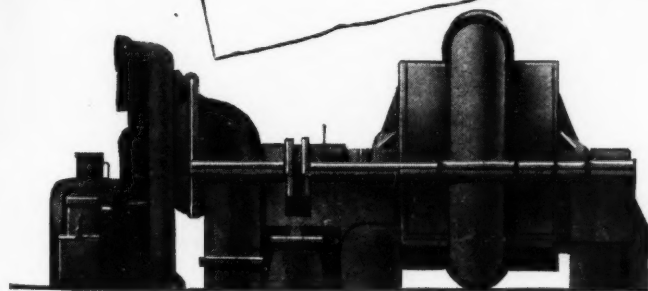
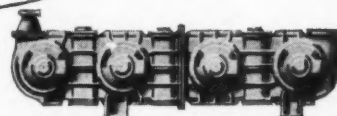
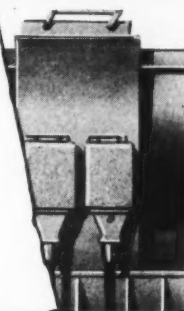
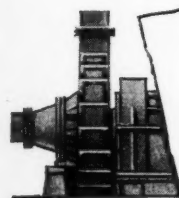
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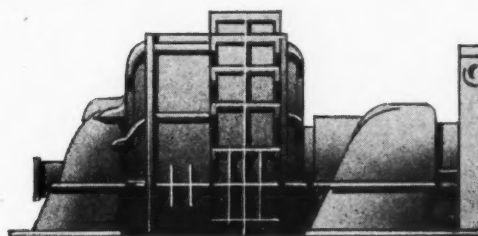
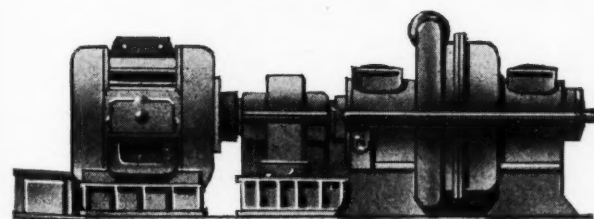


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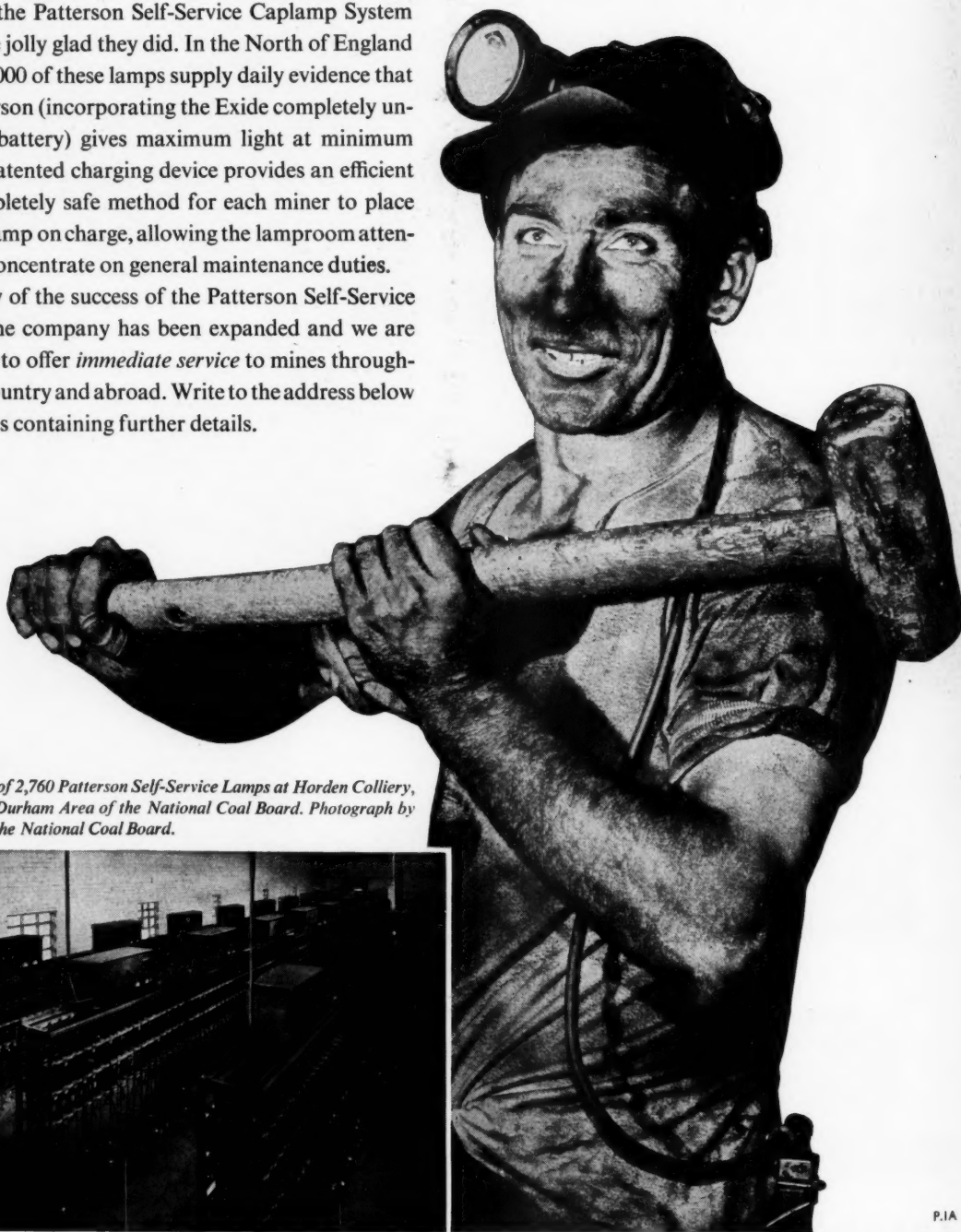
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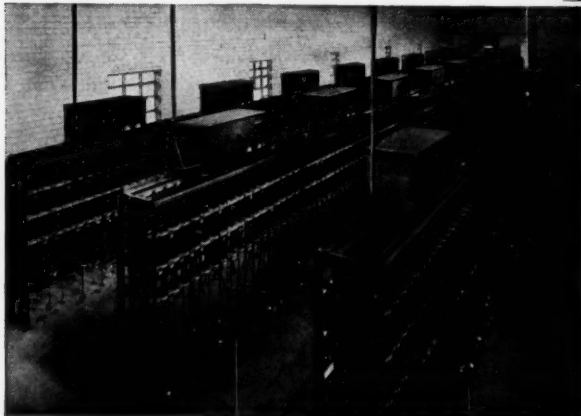
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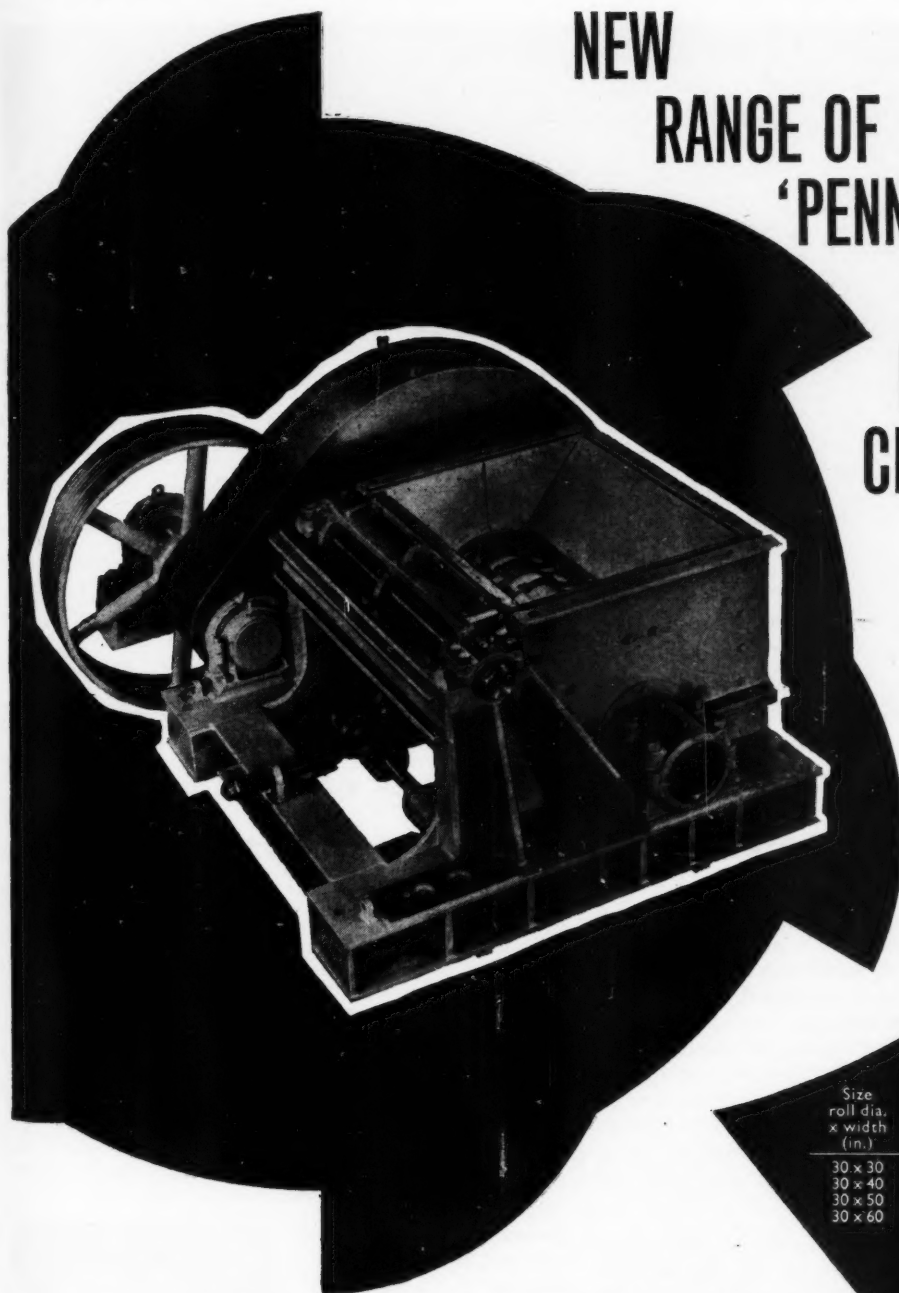


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30 x 60	36	400-500	250

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Atlas Copco Auto-Loader raises output, lowers costs in German coal mine

150% increase in drifting capacity

Germany's chief mineral asset is coal. In fact the rich German coal fields are among the most important in Europe. One of the leading mines west of the Rhine is Pattberg, which in 1958 produced almost 2 million metric tons of consumable coal. Despite the use of up-to-date methods and some of the most modern mining equipment available, Pattberg is faced with two of the current problems confronting the industry:—

- The urgent need to cut production costs to a minimum—due to the increasing competition for markets.
- The growing necessity to eliminate heavy physical labour—reflecting the rising living standards of mine-workers.

Engineers at Pattberg have found that mechanised loading is helping them to solve both problems. The original drifting capacity was 0.44 metres per man-shift. Now, by progressive improvements in loading technique, this has been raised to 1.16 metres—an increase of more than 150%. Their superiority to any similar machines having been proved by stringent tests, Atlas Copco T2GH Auto-Loaders are now in extensive use in the Pattberg mine.

A two-man team carries out the complete drifting operation—drilling, blasting, loading and timbering. While one miner is loading, the other prepares for timbering. The figures in the table refer to drifting in a cross-cut with an area of about 10m² where the average advance is about 2.5

metres a round. Statistics show the average time schedule for a team on an eight hour shift to be:—

		% of effective working time (excluding breaks)
drilling	95.5 minutes	26.7
charging and stemming	51 "	14.4
loading and sundry work	100.5 "	28.3
timbering	109 "	30.6
	356 minutes	100%

The Auto-Loader tips onto an armoured conveyor which is extended once a week. Haulage distance, thus, varies between 10 and 30 metres.

Atlas Copco Auto Loaders

are being used successfully throughout the world for applications for such as cut-and-fill stoping and sub-level caving in ore mines, cross-cut drifting in coal mines and loading operations on the surface. Perhaps they could help improve capacity at your mine? Contact your local Atlas Copco company or agent or write to one of the addresses below:



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The Mining Journal

London, February 26, 1960

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The Mining Industry in the Guianas

THE three Guianas are situated in that larger portion of the world which is considered to be under-developed and in which the general living standards of the people are low. In the Caribbean the need for dynamic, soundly based programmes of social and economic development is particularly urgent in view of the population growth, which is among the highest in the world.

An F.A.O. economist, referring some time ago to the weakness of the Caribbean economy, pointed to the dependence of the region on the export of one or two agricultural products and to the import of a wide range of industrial goods, plant and equipment, and even foods. One of the foremost requirements, clearly, is to create a better balance between the various sectors of the economy, and it is evident that in any attempt to broaden the basis of industrial and commercial activity, the exploitation of mineral resources must play a leading role.

It is against this background that the importance of the Fifth Inter-Guiana Geological Conference held in Georgetown from October 28 to November 6 last year should be assessed. The contributions of geology and mining to the economic advancement of the Guianas are admirably summarised in the addresses to the opening session, which because of their general interest have been published in pamphlet form.

As pointed out by His Excellency the Officer Administering the Government, Mr. D. M. Hedges, the earth's crust knows no international frontiers. Rock formations do not necessarily stop at territorial boundaries. A geological formation known as the "Guiana Shield" is found in the three countries that have carried the name Guiana. At the first of these conferences geologists of the three territories, in order to get to grips with a common problem, decided to pool their knowledge and share their findings. Eventually it was found that this "Guiana Shield" extended westwards to Venezuela and southwards to Brazil. Both these countries were represented at last year's Inter-Guiana Conference, which was also attended by delegates representing government and mining interests in Canada, France, the United Kingdom, the United States and the West Indies.

Mining's growing importance to British Guiana since the war was stressed by Dr. C. B. Jagan, Minister of Trade and Industry, who told the Conference that in the years 1954, 1955 and 1956 the mining industry contributed 12.7 per cent, 9.9 per cent and 11.3 per cent respectively to the gross domestic product, which compares with the combined contribution of sugar and rice for the same years of 16.7 per cent, 14.6 per cent and 14.5 per cent. Dr. Jagan went on to state that the Government's policy was therefore to encourage geological surveying to the utmost and to give special facilities to mining companies which have sufficient capital and up-to-date scientific and technical resources to carry out large-scale exploration.

Another significant point made by the Minister was that the

main difficulty in organising geological surveying in British Guiana had not been the supply of money, but the availability of men who were willing to devote years of their life to exploring the difficult rain forest areas of the country. Not only do geologists have to contend with heavy and sporadic rainfall, but also with other handicaps and discomforts attendant on work in the rain forests. Visibility in the bush is very poor and, owing to the tropical climate, surface decomposition of rocks goes deep and outcrops are scarce. Therefore in the period before air photography became available, a geologist might spend months on a survey and, through no fault of its own, produce very little in the way of definite results. Since 1957, however, the Geological Survey has been reorganised with a well-equipped headquarters in Georgetown and field methods have been revised to employ modern techniques utilising air photographs. Partly as a result of these changes, and partly due to the recent minor recession in industry, it is now easier to attract and retain scientific staff.

The Geological Survey is at present working on an urgent project to complete the reconnaissance geological map of the whole colony. When the draft of this map is ready, in two or three years' time, it will be carefully analysed and experts will be invited to examine it and select areas for airborne prospecting. Special encouragement will be given to qualified companies willing to prospect large areas.

How closely the deliberations of geological conferences such as this are followed by the mining industry, and how great a part they can play in influencing investment decisions, were stressed by Mr. J. N. Fraser, manager of the Demerara Bauxite Co. Ltd. Mr. Fraser recalled that a few years ago he asked why a certain aluminium company was looking for bauxite in British Guiana in areas where its existence had never been suspected. He was told that their interest had been aroused by the theory of the Coropina bauxite, which had been mentioned at the Caribbean Geological Conference in Antigua in 1954. Influenced by this theory, which implies that bauxite may occur in areas previously considered unfavourable, the company in question spent a great deal of money in British Guiana.

Mr. Fraser gave the Conference a comprehensive account of mining developments in British Guiana since the Third Inter-Guiana Conference in 1953. Among them has been the entirely new venture launched by the African Manganese Co., which will result in the establishment of a new community in the North West District. and will greatly assist in the general development of that part of the interior.

On the subject of bauxite, Mr. Fraser said that in 1952 the Guianas contributed about 37 per cent of world production. Although their production has remained about the same, their share of the world total fell to about 21 per cent in 1958. On the whole, it appears that the bauxite industry in British Guiana and Surinam has reached the stage where, in the absence of any abnormal increase in demand no spectacular growth in production is to be expected.

The picture, however, is far from depressing, for there has been a continual influx of new capital, part of this investment being devoted to the solution of the particular problem of getting at the bauxite in order to mine it. The bauxite deposits that were easily accessible and close to the surface have been mined out and the producers are now faced with the task of removing ever-increasing amounts of overburden. In British Guiana Demerara Bauxite has tackled this problem by using a combination of sand-pumps and large draglines. Similarly, in Surinam a large cutter-head suction dredge has been put into operation by Suralco and a wheel-cutter excavator of advanced design was recently erected by Billiton.

Thus mining techniques in the Guianas have changed radically in the past ten years. Indeed, if the industry had not brought in new methods, had not invested large amounts of capital, and had not paid careful attention to efficiency, it

would no longer be competitive. Jamaican bauxite, for example, lies in limestone pockets with no overburden at all.

Although there have been no major developments resulting from new discoveries of bauxite in the Guianas during the past six years, a fundamental change has taken place within the industry itself, namely that from being merely suppliers of ore to the aluminium industry, the Guianas are now entering a phase of further processing. In Surinam, work has commenced on the construction of the Brokopondo Hydro-electric Scheme, which will supply power to a new aluminium smelter. In British Guiana the most significant development currently taking place is the construction at Mackenzie of the first alumina plant in the Guianas, which will commence operation in some twelve months' time with an annual production capacity of nearly 250,000 tons.

These new developments will require for their operation new sets of skills, and it might well be that the pool of workmen trained in these new skills will help to attract other industries.

According to Dr. Jagan, new capital invested in mining jumped from a figure of \$3,700,000 B.W.I. in 1956 to \$25,000,000 in 1957 and \$22,000,000 in 1958. The Minister expressed some regret, however, that investments were still being devoted to mineral extraction and processing to a semi-finished stage. Obviously the Government would like to see in the country the smelting of ores into ingots and also the development of ancillary industries. This is a most understandable and desirable aim, which may well be achieved in time. Meanwhile the establishment of the alumina plant at Mackenzie is a notable step forward in the right direction.

UNITED STATES IRON-ORE RESOURCES

Total domestic iron-ore resources of the United States have been estimated by scientists of the Geological Survey at approximately 75,000,000,000 l. tons of crude ore, reports the Department of the Interior.

Of this amount, about 10,000,000,000 tons is classed as reserves, material usable under existing economic and technologic conditions. The remaining 65,000,000,000 tons is potential ore, material likely to become available under more favourable conditions. The potential ore may yield 25,000,000,000 tons of concentrates and direct-shipping ore.

Since the last summary, which was made several years ago, a total of 25,000,000,000 tons has been added to the estimates. This increase resulted partly because of further exploration and more complete information but more particularly because of the inclusion of additional low-grade material, the magnetic taconite of the eastern Mesabi Range in Minnesota.

The greater costs of beneficiating the taconite as compared to production of direct-shipping ore is mainly or entirely offset by savings in shipping charges and in blast furnace operation.

In this connection, attention may be drawn once again to the recent statement by Mr. R. W. Whitney, vice-president of the Howna Mining Co., that the greater the sums spent by the American steel industry on developing high-grade ore in out-of-the-way places, the more feasible it becomes to spend more money on ore beneficiation facilities nearer home (*vide The Mining Journal*, Oct. 2, 1959, p. 310).

At present an average of 110,000,000 l. tons of iron ore and 70,000,000 tons of scrap iron and steel are required annually to meet the needs of steel and manufacturers in the United States. This is twice the average annual consumption of iron ore between 1900 and 1930, and according to Martha S. Carr and Carl E. Dutton, authors of USGS Bulletin 1082-C, "Iron-Ore Resources of the United States," plans of the industry for expanding furnace capacity will call for added annual ore consumption.

Iron ore mining began in the American Colonies around the year 1619 and for 225 years was limited to eastern States where fuel and markets were readily available. Production of ore from the Lake Superior region began in 1846. By 1890 this area became the leading domestic source and since 1896 the Mesabi has been the world's most productive district.

Although proximity of raw materials, water transportation, and markets resulted in centralization of the country's iron and steel industry in the lower Great Lakes area, increased imports of iron ore being delivered to eastern States and new demands for steel in nearby markets have given impetus in recent years to expansion in steel-making capacity in the latter area.

Tabulation of United States iron-ore resources include reserves and potential ore of all deposits and areas known to the authors at the time of the compilation that contain at least 200,000 l. tons. In the compilation of iron-ore resources, which is the most detailed one that has been published by the Geological Survey, the reserves and potential ore of greatest national importance are indicated. Copies of Geological Survey Bulletin 1082-C containing this information are obtainable from the Superintendent of Documents, Washington 25, D.C. (price 75 cents).

MOROCCAN MINING IN 1959

As was expected, the Moroccan phosphate mining industry continued to develop at a sustained pace during 1959, when production from the Khouribga and Louis Gentil mines forged further ahead to reach a new record of 7,163,503 tonnes, compared to 6,335,822 tonnes in the previous year. Exports also reached a new record high with a total of 7,026,702 tonnes.

Exports went mainly to Europe, China, Formosa, Japan, South Africa and Brazil, including 670,804 tonnes to Britain, 1,055,077 tonnes (a record) to France, 506,582 to China, 656,335 to Italy, 612,709 to Western Germany, and 343,337 to the Union of South Africa.

The zinc and lead mines with their associated smeltery in north-east Morocco also enjoyed an excellent year. While lead ore production was slightly less (falling from 136,936 to 131,998 tonnes), zinc ore was well ahead at 101,112 tonnes (86,771). Exports of these ores were 90,947 and 100,840 tonnes respectively. The Oued el Heimer smeltery near Oujda produced 28,674 tonnes of soft lead for export to U.S.A., France, Czechoslovakia, W. Germany and Algeria, plus 38,392 kgs. of silver, of which about 36,000 kgs. were exported to France.

Having completed their first full year with new equipment in full operation, the Bou Azzer de Grara cobalt mines on the eastern flank of the High Atlas mountains produced 12,071 tonnes of ore compared to 9,259 tonnes in the previous year. There was no significant change in exports which remained steady at 9,317 tonnes.

Manganese picked up again, both Bou Arfa and Imini showing improvements over the previous three years. Output was 391,869 tonnes of metallurgical grade and 78,698 tonnes of chemical grade (compared to 353,661 and 56,424 tonnes respectively in 1958). Exports of chemical grade totalled 77,331 tonnes of which 57,493 tonnes went to the United States.

Outputs of anthracite and iron ore declined by approximately 10 per cent. and 25 per cent. respectively. Anthracite production was 464,663 tonnes, of which 198,505 tonnes were exported and 186,966 tonnes were sold on the local market. Iron ores which totalled 1,265,022 tonnes (compared to 1,538,426 tonnes in 1958) met with marketing difficulties and

exports amounted to 941,126 tonnes of which 431,047 tonnes^s went to Great Britain, 151,628 to France and 76,830 to Spain.

Other figures for 1959, with the previous year's total in brackets, were as follows: iron oxide 2,107 tonnes (1,927); iron pyrites 14,418 (18,450); and barytine 36,808 (42,692). Average labour force in the Moroccan mining industry in 1959 was 34,000.

BRIGHTER PROSPECTS FOR U.S. COAL

After dropping steadily since 1956, U.S. coal production is expected to reverse the downward trend in 1960 according to forecasts made by the big producing companies. A rise of some 40 million tons is anticipated during the next twelve months which would add 200 million dollars to the industry income and so considerably help the industry in its competitive battles in the fuel markets. These forecasts, however, are in part based on a very nebulous coal export situation, but the big increase in demand is expected to come from a fairly assured expansion of U.S. industrial activity.

Despite increased mining costs, largely attributable to a rise in union wages of two dollars a shift, the average pit head price of bituminous coal in the U.S. dropped last year to 4.65 dollars a ton from 4.86 in 1958. This once again illustrates the ability of the U.S. coal industry to offset rising costs by improved productivity. The coal operators have so far fought back with a fair degree of success against increasing competition from oil and natural gas but only by sustained maximum effort can the coal market remain assured.

The Peabody Coal Co. — second largest U.S. coal producer — and Curtis-Wright Corporation, an aircraft company, have announced the formation of a joint company to produce a variety of products using bituminous coal. Initially, the new company is to build and operate a small commercial plant for the application of processes developed by the parent companies. These include the production of coal tars and coal-based paving binder for roads and airport runways.

BUREAU TESTS FEASIBILITY OF USING WATER JETS TO MINE COAL

The U.S. Bureau of Mines has begun experiments in mining American bituminous coal by using powerful jets of water. Site of the research is an old mine of Rochester & Pittsburgh Coal Co., near Indiana, Pa. Here Bureau engineers employ a jet of water, at pressures up to 4,000 p.s.i., against the coal face to break down the coal. The system resembles that used for many years in the hydraulic mining of gold in certain parts of the Western U.S.

An immediate advantage in the hydraulic mining of coal, according to the Bureau, is the elimination of explosive coal dust. This safety measure might be coupled with increased output under certain conditions, an essential element if commercial acceptance were to result.

The Pennsylvania tests, which will continue for several months, will include studies of types of nozzles, pumping equipment, and water lines, the effects of varying the water pressure, and finally the possibility of using water to convey the broken coal from the mine or to underground loading points.

THE COPPER SITUATION IN CHILE

The Copper Law

THE legislation by which the Chilean Government gave a new deal to the industry, present and future, with special privileges to the companies now operating, is contained in Law No. 11,828 enacted on May 5, 1955; regulations for its application issued on October 18, 1956, and the Copper Workers Statute, effective on May 15, 1956. Some of the specific objectives of the law have been amply achieved. One of the principal aims was to promote increases in production, the basic inducement being elimination of the old discriminatory exchange rate for the dollars which the companies had to sell to obtain pesos for local operating expenses, wages, salaries, supplies, new construction, maintenance, which, prior to 1954 was 19.37 pesos per dollar when dollars were freely saleable at eight or ten times that rate. Later the Government paid the companies at the rate of 19.37 pesos per dollar combined with the prevailing official rate which on November 10, 1954 was 200 pesos and on December 14, 1955, 300 pesos per dollar. From here on (after the Copper Law came into force) the companies were entitled to receive the full official rate fixed by the Government. On February 2 it had risen to 1,051 (all buyers rate) and it has remained at 1,051 ever since. In fact, this exchange rate for dollars which are freely transacted, is likely to prevail for a long time, following the present Administration's fiscal policy.

The exchange rate has been one of the principal factors in increasing production from 324,652 tonnes in 1954 to 496,745 in 1959.

The increases received every year by the workmen and men in pay and fringe benefits and the higher cost of materials and supplies bought locally have been cushioned by the enormous rises in the exchange rate at which the companies have sold their dollars. However, if the Government is going to carry out its intentions then the exchange rate will not be increased in 1960, so that the companies have got to the limit. In 1960 any rises in pay, fringe benefits, cost of local materials, social security and other items will not be offset to any extent whatever by a better exchange rate, as has been the case for so many years. This would augment the operating costs, but against it there has to be considered the great increase in Anaconda's production.

Taxes

In 1954 which was the last full fiscal year under the old tax system the companies paid a total direct tax of \$72,746,000. In the 1959 Budget the Government estimated income from the companies at the equivalent of about \$59,800,000, although the actual payments may have been somewhat higher. But it is evident that comparing the last year prior to the application of the Copper Law in 1959, production increased about 50 per cent and taxation actually declined. As is known, the present tax set up is 50 per cent basic and 25 per cent

sliding scale, the latter based on low minimum production at each mine stipulated in the Copper Law.

For some years El Teniente has been paying more taxes than Chuquicamata; even so their production costs are lower than those at the latter mine. The smaller assessment at Chuquicamata is caused by the rebate earned on the 25 per cent sliding scale tax on profits (in addition to the 50 per cent basic) because of the enormous increase in production above the minimum stipulated in the Copper Law in 1955. El Teniente's increase over its minimum is far smaller. 1959 costs at Chuquicamata are estimated to be slightly less than 15c. per lb. delivered, before tax. At El Teniente the costs are lower.

Article 2 of the Copper Law states that new companies in the large (25,000 tons yearly production) copper mining industry that may be established in the future (after May 5, 1955) shall pay a sole tax of 50 per cent. This is applicable to Salvador so that this mine will be not only one of the world's lowest cost producers at the rate of 120,000 tons yearly but pays much lower taxes than Chuquicamata or El Teniente. Other inducements in the Copper Law such as those for building new electro facilities and the setting up by established producers of local fabricating plants, have not been utilized so far; indeed, Kennecott built an electro refinery in Baltimore when local opinion was hoping that it would be constructed in Chile. However, there has been talk of Anaconda building a refinery in the port of Chañaral commencing at the start of 1960.

The Copper Department was set up by the Copper Law 4½ years ago, since when it has been a statistical bureau at best. Article 18, clause (d) of the Copper Law states that the Board (Committee) of the Copper Department may "contract directly sales of copper in representation of the producing companies", but the Department has never sold one pound of copper, leaving this to Anaconda Sales and Kennecott Sales. The Copper Department receives from the companies a commission of ¼ per cent on the selling price of copper, free of tax, and charged off by the companies to non-taxable general expenses.

The Government plans to merge the Copper Department with the Mining Credit Bank and other official mining entities.

Markets for Chilean Copper

In 1959 Anaconda and Kennecott delivered to the local fabricators some 28,000 tonnes of electro and 12,500 of fire refined, of which 21,000 and 10,000 respectively were used for the manufacture of export articles (principally wire), and the remainder for fabricating items for domestic use. In 1960 it is probable that the tonnage delivered by the companies to the fabricators will be much smaller as no wire has been sold to the Communist orbit for 1960 delivery as was the case in 1958 and 1959.

For years the only new markets that existed for Chilean copper, primary or fabricated were considered to be in the Communist orbit. During the past few years visits to Russia and to Red China have been made by ex Ministers of State, Senators, Congressmen, representatives of the Copper Department, of the fabricators; private citizens, and industrialists, while Chilean diplomats accredited to nations near the Communist countries have also tried their hands at developing trade, principally in the export of copper from this country.

We are indebted to Bache & Co., New York, for permission to publish this report from their Chilean Correspondent, Mr. J. W.

Hitchman, which has been abridged.

The only concrete result of any importance was the sale to Russia of 16,000 tons of wire in 1958 and some 22,000 tons in 1959, of which it was subsequently ascertained, 60 per cent went to Red China; and the recent delivery to Red China of 10,000 tons of nitrate for cash.

There appears to be no interest in the Communist countries for Chilean electro, fire refined or blister; even if there were it is doubtful that they would get any. As for fabricated products the local fabricators either cannot now compete with European fabricators or are not allowed to. The 10 per cent rebate they got on their purchases of copper from Anaconda and Kennecott was cancelled as of January 1, 1960.

There is no really new market for Chilean copper and the huge production increase evidenced in 1959 which can well continue in successive years will have to be placed in the traditional markets.

New Production

Plans for new production are being carried out. On January 8 the Cerro de Pasco Corporation announced that it would invest between 70 and 90 million dollars at Rio Blanco where they have an option which expires next October, and that some 62,000 tons of copper would be produced annually. No decision had been published about building their own smelter or to ship their concentrates to a Government smelter planned at Ventanas, north of Valparaiso, but a decision will have to be made soon. Cerro also stated that there were 116,000,000 tons of 1.6 per cent ore at Rio Blanco.

At Mantos Blancos near Antofagasta the Maurice Hochschild group, principal financiers, are going ahead with their plans to produce 1,500 tons monthly of blister, commencing in the second half of 1960. The International Finance Corporation increased its investment here from \$2,200,000 to \$3,100,000. They expect to mine 3,000 tons of ore daily.

Rio Blanco will come under the big mining bracket and will only pay 50 per cent income tax. Mantos Blancos, as their output will be lower than 25,000 tonnes of copper yearly, will not be so classified.

Smaller new developments are being made by Canadian interests which have purchased the Paposo mine near the port of Taltal and propose to invest \$3,000,000 to get into production of concentrates. Japanese firms are also making small investments to get into production one of their investments being near Mantos Blancos.

Production Increases at Existing Mines

Ambitious plans are under way at existing mines in the medium sized classification. The French du Zaita company is stepping up and also rebuilding its smelter at Chagres situated between Santiago and Valparaiso and expect to be making some 8,000 tons of blister yearly. The Disputada de Las Condes company, near Santiago, also plan to up their output from the present 5,500 tons. Maurice Hochschild & Company at mines other than Mantos Blancos are getting out a total equal to about 2,000 tons yearly of copper from their concentrates and precipitates. There are several other smaller independents planning upwards.

The Government smelter at Paipote expects to augment purchases of ores and concentrates this year and increase their output of blister to 24,000 tons in 1960.

There are four types of production boosts: at the three U.S. mines (76,696 tonnes in 1959 over 1958, in spite of 16,000 tons lost by the El Teniente strike last October); from new mines now being developed; from present mines in the medium sized classification; and from the Government smelter at Paipote.

General

It is reported that the Government finally signed a contract with German interests to build the long-planned smelter at Ventanas, near Valparaiso, to yield 25,000 tons of blister yearly, but there is opinion that even if Anaconda send their concentrates from La Africana to Ventanas the smelter will never get enough material to produce the quantity of blister planned. Therefore the final decision of Cerro de Pasco to either build their own smelter or utilize Ventanas is important. If Cerro's concentrates are sent to Ventanas then the smelter there will have to have a capacity of about 8,000 tons yearly instead of 25,000 and Cerro will be expected to finance most of its construction.

No voluntary production cuts were made by the companies during 1959; in 1960 none are expected. In any event Chile would be one of the last producers to restrict the output, and Article 16 of the Copper Law states that any such reductions may not be proportionately higher than those already made by the companies at their mines outside Chile.

On September 11, 1958 the House Committee on Legislation printed a Bill presented by a Radical Congressman to set up a State Corporation to take over the copper mines. It went a few steps further and also stipulated taking over the iron ore mines, nitrate plants and part of the banking systems. It is still in committee.

As a matter of fact there is no opposition majority in either House to put any restrictive amendments over; if there were, the President would veto the law. At this time the Administration has a temporary political majority in the House of 66 per cent of the members and 58 per cent in the Senate. The companies can look forward to no interference with the Copper Law all the time the present Administration is in office, expiring November 4, 1964, and maybe long after, depending on the political ideology of its successors.

The United Nations is earmarking \$900,000 and Chile \$700,000 to make the geological survey of the Atacama region in this country commencing in 1960, which many expect will uncover important new copper ore deposits.

Molybdenum is being produced at Chuquicamata and the necessary plant to do so at Salvador will shortly be installed. El Teniente was the first mine to produce molybdenum in Chile (1949) which is now the second largest producer of this metal in the world.

The Current Year

The "mechanical potential" at Chuquicamata, Salvador and El Teniente was approached in December 1959 when the output at the three mines was nearly 50,000 tonnes. A bit more is planned at Salvador for 1960 — maybe 8,500 instead of the present 7,000 — and some more could be squeezed out at the other two mines, but in any event December 1959 was an all-time high. Six hundred thousand tons a year at these three places is mechanically feasible but any figure would be affected if there are labour troubles at Salvador after May 30 and at Chuquicamata after September 30. El Teniente's collective labour contract does not expire until January 1, 1961. Possible water shortages at El Teniente may not have any greater effect than in previous years, and did not prevent this mine from putting out 172,378 tonnes in 1958 and 163,845 in 1959 although shut down during the entire month of October.

Many factors may or may not affect production, but it is generally believed that during 1960 the three mines will go right ahead at full blast until slowed down by factors over which they have no control.

The "mechanical potential" at the three mines in 1960, plus that of the other copper mines here, is over 650,000 tonnes; in five or six years' time, as has been suggested, this could be close to 750,000 tonnes yearly.

METAL CHEMICAL DEVELOPMENTS

HAVING for over 50 years recovered and distributed ore values in the form of metals and alloys, the Union Carbide Corporation, of New York, U.S.A., is now turning to the production of chemical derivatives and other transition metals. Based on such metals as chromium, vanadium, tungsten, molybdenum, titanium, zirconium, manganese, columbium and tantalum, these new organic and inorganic products include such materials as titanium trichloride, chromium acetylacetonate and zirconium pyrophosphate and many of them either make a new chemical process economically feasible or facilitate work which, technologically, was previously impossible or impractical.

New Derivatives

Instead of producing standard chemical salts of these metals which are currently in production and use, Union Carbide is directing its efforts towards supplying new derivatives, not now commercially available, either in response to known industrial needs or in anticipation of creating new uses. At present, 128 different chemicals are in the development stages, for about 100 of which uses will have to be found. Of the rest about a dozen are now approaching the pilot-plant stage. Some of the applications of these chemicals will probably be the filling of at present unrecognised needs. In the field of metal chemical products the hope of obtaining materials with unusual properties would appear to be greatest in compounds of the newer metals which so far have been relatively little explored.

Metal chlorides, for use as reagents for producing other metal chemical products, are among the first of the new metal chemical products being produced and these include titanium, trichloride, vanadium dichloride and trichloride, chromous and chromic chlorides and trichlorides, molybdenum pentachloride, tungsten hexachloride, manganous chloride and zirconium trichloride. High purity forms of these products can be produced in sufficient volume for commercial testing and it is claimed that very few of these products are commercially available from other sources.

Metal chemicals are being produced at the Union Carbide plant at Niagara Falls, N.Y., U.S.A. Long experience in processing ores, increasingly by chemical techniques, made expansion into this field a natural step. Indeed, chemical processing methods, such as the use of high-pressure autoclaves for preparing chemical derivatives of metals by combining metal atoms with atoms of carbon and oxygen and the use of a plate-and-frame filter for separating a metal chemical from a solution, are to a greater degree supplanting traditional smelting and refining methods for recovering values from ores.

As well as developing manufacturing processes, Union Carbide has also been investigating the use of metal chloride products in such industries as plastics, rubber, pharmaceuticals, petroleum and other organic syntheses. Some are finding uses as catalysts in the production of polyolefin-type plastics

Paralleled with the development of the newer metals as engineering materials capable of meeting new technological requirements of the present day is the production of chemical derivatives which is opening up new and growing markets for mineral producers.

Some of these developments are here described.

such as polypropylene and others are being studied as raw materials for producing new organic derivatives or as specific reducing agents in the organic chemical and pharmaceutical industries.

Binary Compounds

With certain elements like nitrogen, carbon, boron, silicon and phosphorus, these "transition" metals form binary chemical compounds which exhibit extremes of hardness and refractoriness, individual ones finding important uses as abrasives, lubricants and catalysts. For example, molybdenum disilicide may be slip cast into heating elements or chromium carbide may be pressed and sintered to form extrusion dies. Another refractory metal compound, silicon nitride, is being used where good resistance to heat, thermal shock or the attack of molten non-ferrous metals are required. One such use is in thermocouple protection tubes which resist 2,700 deg. F. (1,482 deg. C.) temperature in an open-hearth furnace. Only a few of these binary compounds are, however, so far in commercial use; most of them await further study and the development of promising applications, as is the case, for instance, with a series of transition metal phosphides which are currently being made available.

Non-Stoichiometry

Many oxide materials, too, can be produced in which the elements combine in less than theoretical proportions so that they contain slight excess or deficiency of oxygen, as, for example, titanium sesquioxide, Ti_2O_3 . These non-stoichiometric compounds often possess unusual properties, suggesting special uses as catalysts, reagents and semiconductors. Furthermore, the non-stoichiometry persists when double oxides are formed in various molecular ratios or when oxide salts of other metals are formed, e.g. barium titanite. Metal oxide products with remarkable properties have also been obtained by producing powders in extremely finely divided forms.

Other new metal chemical compounds receiving widespread attention are the heavy metal acetylacetonates, which though chelate compounds, are unlike other compound metals of this class (metal naphthenates and oleates) in that their solutions in aqueous or organic systems are neutral. They are being evaluated for such uses as anti-knock agents, soot removal compounds, lubricating oil and plating bath additives, ignition polymerisation and oxidation catalysts, vulcanisation accelerators, stabilisers, drying agents and insecticides.

In addition, a large number of new salts of the transition metals, such as phosphates, formates and fluorides have been synthesised and are being studied. Some are showing promise as pigments; others as high-temperature lubricants.

By J. GRINDROD

THE WORLD NEEDS MORE NEW GOLD — II

Future Production

THE possibilities for future gold production are imperfectly known because exploration in active mines generally is limited by short-range requirements, exploration for new ore bodies has long been discouraged, known reserves figures are restricted or generalized at many levels, much data that more or less indicate additional reserves are not generally known, and no one can presume to count on ore that is not somehow known to exist. We are also limited by the necessity of reasoning on the imperfect basis of our present knowledge of ore deposits and of capabilities of making use of the known raw materials. For these reasons, past estimates were far too conservative and were not accurate predictions of the future. Consequently it is possible to assume, as did Hardy (1936), that current estimates of future production will also turn out to be low. Although we never can be sure, at any given point, that the past and present are an indication of the future, several pieces of information suggest that under estimation is still probable.

Consequently, one is more likely to be right not to be too much impressed by data that are discouraging for greater future production. An entirely new source of gold might become profitable even before present sources are exhausted. At the same time, production is so far less than demand that a continued shortage must be expected for the future.

New Areas

No large areas that have not been seen at least briefly by man remain in the world; the age of startling new geographical discoveries is past. Although many substantial areas have not been well explored, the presence of gold tended to become known early. It was commonly collected by early man and by local natives, attracting attention of the early explorers. The areas that were not explored, consequently, appear to have contained little indication of gold deposits. Only the polar regions can be excluded from this generalization.

Several authorities have pointed out that all the mining districts have long been known and that new, important areas have not been discovered in recent decades. The statements, and the implication that new mining districts are a thing of the past, probably are not completely correct. Although major areas of recent discovery have largely contained materials that only recently became important, there is room for new discoveries in many of the known areas. Much of the surface of the earth is taken up by seas, recent extrusives, sedimentary formations, varied surface debris and soils. These are not all potential mineral districts, of course. Such cover is sometimes so thick that economic mining operations are not even in the realm of future possibility.

Mining districts are most commonly located in mountainous areas, not only because they are easier to find, but also because deposition of many minerals and metals is closely associated with mountain building processes. In general the large basin areas have always been areas of deposition, and the present mountainous areas have always been the "backbones of the world". Some areas at present are truly sites of mountain building processes, but, because of advanced peneplanation, do not now contain mountains. Bedrock might even be buried.

Geological investigation can often determine the presence of such "stubs", however; areas that might be prospecting ground can be outlined. Gold deposits are generally associated with acidic intrusives, acidic intrusives with mountains. Economic placers are mostly found in or adjacent to mountainous areas. Consequently there is good reason to believe that most of the concealed areas do not contain deposits of

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gold, but there is more than enough area remaining that is worth continued interest.

New, major discoveries of ore are being made within the known districts and some of the districts have been found to be larger in area than first supposed. Other areas are almost new, since they were inaccessible at first. Some areas that were considered to be but weakly mineralized now support thriving industries; others are being considered at present for future production.

Consequently new discoveries of gold deposits will doubtless come in the future. Most of them probably will be made within the presently known areas. The United States Geological Survey is collecting production and geological data for all the domestic deposits that have produced more than 10,000 ounces of gold. The information will first be released in August of 1960 at the International Geological Congress in Copenhagen. Many nations, including Russia, are scheduled to submit such general information for many commodities. Much of the data doubtless will become available in subsequent publications.

Deep Ore Bodies

Several types of new ore are being discovered in bodies that are not exposed at the surface. So far, these have always been deeper lying extensions or general corollaries of mineralization that did exist where it could be found more readily. Many districts thus far have not been so explored; encouragement generally is lacking for deeper exploration when the "bottom" is reached. Other areas of shallow, weak mineralization have not been much tested even near the surface. Possibly some of these might contain evidence, not now understood or noted, that might lead to exploration and discovery of worthwhile mineral.

Gold mines in South Africa, India and California are typical of others that show gold is deposited over a very great vertical range. According to present theories of ore formation, deposits of gold are sometimes formed at great depths and pressures. These in particular might not have been exposed at the surface of the earth. On the basis of pure chance most ore bodies should be expected to be at some distance below the surface.

Beyond any doubt new, deep deposits of gold, as well as of other materials, will be found, particularly in the known areas of mineralization. Difficulties of exploration and cost of development and mining generally are formidable obstacles, but they will not always remain so.

Ocean Waters

Gold was found to exist in solution or suspension in sea water in 1872, and several measurements have since shown the amount to vary from 0 to 1 grain per ton. Converting the highest amounts gives the startling figure of 260 tons of gold per cubic mile of water. The average content given by Cresswell (1959) is 12 lb. Au/km³. Another estimate is \$200,000,000/mi³.

Sea water is often considered as a possible source of various materials, but extraction generally is far from being economic.

Dow Chemical Company actually has extracted gold from sea water on an experimental basis in its magnesium producing plants. The cost was too high but, according to *Mining World* (August, 1959, p. 8), "Now there is being advertised 'a substantially new process' which will 'secure a virtually stable, direct, inflation-proof income'". *Engineering and Mining Journal* (Oct. 1959, p. 124) reports the increasing production of salt from sea water by electrodialysis.

Conversion of ocean waters to fresh water has long been considered for dry areas of the world. Large-scale, experimental plants are being tested in various areas; new plants are being constructed. Predictions that the shortage of water will greatly increase in the future are based on good evidence; hence more and more sea water will probably be used. Sufficient concentration of the material that exists in all sea water might even generate a new type of "ore". If the equipment ever is adapted for installation on barges, the plant conceivably might be anchored in international waters to escape national taxes. If production of fresh water still remained an objective, of course, transportation would be a larger item.

Thus the possibility of economically producing gold and other materials from sea water appears somewhat nearer. The effect on conventional gold operations would doubtless be slight, however. The sea gold would be expected to take on a full share of the cost of the operation.

Shaft Sinking Achievements in South Africa

The South African gold-mining industry must hold the record for putting up world shaft-sinking records—the present score is three in less than six months. The latest is at President Steyn's ventilation shaft adjoining the No. 3 main shaft where the 1,000 ft. figure was broken last November. The new figure is 1,020 ft. The actual excavated diameter is smaller—24 ft. and 22 ft. lined against 28 ft. and 26 ft. in the main shaft—but it is significant that the new record was established using simpler and thus less expensive equipment.

For example, whereas in the main shaft both rock and service hoists were provided, only one was employed in the latest effort. The sinking stage and mechanical cleaning equipment were scaled down, 7-ton kibbles being used, compared with 10 tonners in previous record-breaking performances. In consequence the average cleaning rate was 370 tons a shift, against the 570 in the main shaft. The average advance per shift was 9 ft. 8 in. compared with 9 ft. 9 in., but the number of rounds was increased from 98 to 104.

Where the next record will come from is open to debate in view of the intensive sinking programme now underway, but a favourite among mining men for the second part of the year is Hartebeestfontein G.M.'s No. 4 shaft in the Klerksdorp district, where full-scale sinking is scheduled to start up in July.

This will have a lined diameter of 24 ft. with a final depth of 7,500 ft. to provide downcast ventilation and be used for handling rock, men and material. Apart from other factors, this shaft will start off with two advantages in achieving a high sinking rate. The first is that 15 ton kibbles will be employed, which must speed up cleaning. The second is that it is most probable that rope guides will be used in the shaft, attached to streamlined buntons of Anglovaal design at shaft stations where conveyances will require steadying when being loaded or unloaded. It will, therefore, be only necessary to construct the minimum of buntun pockets during lining operations.

Extension of the Past

The possibility for new discoveries legitimately can be roughly guessed by means of generalities. Production of gold over the years has increased steadily although periods of recession lasting for several years have been pronounced. Better technology and accessibility, and other factors gradually make new deposits available and profitable. All mining increases steadily in volume, repeatedly making up for recessions, and many of the operations produce gold as a by-product or co-product.

When new sources of gold are not found, production will gradually drop—the end will not be precipitous. When the decrease in production becomes of real concern, greater efforts will doubtlessly be made to locate new sources. Since production is not falling off, it appears completely safe to assume that the end of new discoveries and of increasing production is not yet at hand. Since there has been no concerted, directed, intensive search, it is also presumable that when it does come new gold discoveries will be made.

Bell (1956) expected production in the immediate future to be slightly better than in the average, immediate past because of development of a new field in the Orange Free State of Africa. Longer range future production, on the average, was expected to be about the same as in the past. The prediction is typical of others that have been made.

Another shaft-sinking performance in recent weeks, but in anything but a happy context, was the effort to get a shaft down to more than 400 miners entombed in the Coalbrook Colliery—12 ft. in diameter. Starting from scratch, all the preliminary work to allow full-scale sinking to commence was completed in 10 days. This included the shaft collar, foundations for the headgear and hoists and the erection and installation of the latter. Under normal conditions, this work would have taken six weeks—and not working slowly at that, with all planning done well in advance.

The key to the operation was the existence at Welkom of the main equipment used for sinking the 12 ft. dia. ventilation winze at Welkom G.M. a year or so ago—a headgear and sinking and stage hoists. The assistance of Mr. H. MacConachie, consulting engineer, was invoked at noon on January 24. By that evening the shaft site had been decided upon, and the heavy equipment was being loaded at Welkom and the mine stores there ransacked for ancillary equipment. In addition, the main suppliers and manufacturers of mining material and equipment on the Rand, some 50 miles away, had been phoned and told of urgent needs. They went into action immediately, although it was Sunday and started delivering on the shaft site early Monday morning. Two major engineering jobs were completed at high speed with staffs working round the clock. They were the sinking stage and shaft tubbing for concreting, the original ones on the Welkom job having been broken up.

At the end of 10 days the master sinker, Mr. Keith Richards, of President Steyn fame, took over with a composite sinking crew from Anglo Free State mines. Not only was all the essential equipment in operation, but shaft offices, change-houses, workshops and storage sheds built. From then sinking went on steadily averaging 20 ft. a day. in an atmosphere as calm as that prevailing at any South African sinking operation, with no indication whatsoever of the concentrated effort that went into the preparatory work.

MINING MISCELLANY

A copper organization, to be represented on the Copper Development Directors' Committee, has been formed in Italy under the name of Centro Italiano Aviluppo del Rame. Based in Milan, the organization was set up by Italian copper processors and foreign copper producers, and is to promote more widespread use of the metal.

During 1959, export figures for iron ore from Goa totalled 3,630,076 tons, and for manganese ore, 144,637 tons. The principal importers of Goanese iron ore were Japan, Germany, Italy, and Holland, while Germany was the main importer of manganese.

Large-scale production has now started at the Cartagena plant of Espanol de Zinc, which was completed last year. Initial production is at an annual rate of 20,000 tonnes of zinc and 36,000 tonnes of sulphuric, and additional installations for processing are planned. According to reports from Spanish sources, U.K. interests are seeking large quantities of zinc on the Spanish market, or even a holding in a Spanish zinc refinery.

Barbara Erzbergbau A.G., a Düsseldorf prospecting and operating company, claim to have discovered an economic iron ore deposit in the Staffhorst area, some 30 miles south of Bremen. The deposit, estimated at 100,000,000 tonnes, lies at a depth between 900 and 1,400 m., spread over a wide area. Its content is reported to be 38 to 42 per cent of iron, which could be concentrated to 50 per cent, and 7 to 8 per cent SiO_2 . It is thus much higher than that of other West German ores, though not comparable with imported ores. Costs of possible operation are being ascertained, but the depth may make exploitation difficult.

It is expected that phosphate produced in Togoland will be in the markets in autumn, 1960. Production will be at the rate of 600,000 tonnes initially, and will be raised to provide 750,000 tonnes annually for export.

Representatives of Mexican concerns are reported to have arrived in Brussels for discussion of Belgian plans to erect a zinc works in Mexico.

Preparations for exploitation of the Mauretania copper deposits at Akjoujt are now virtually complete, and production of the oxidic ores contained in the reserves is soon to begin. The exploiting company, Société des Mine de Cuivre de Mauritanie (Micuma), is completing negotiations with the French Government for credit necessary to carry through the scheme, which is estimated to cost some 70,000,000 New Frs. (£5,000,000). The Akjoujt reserves are estimated at 7,500,000 tonnes of oxidic ore with 2.8 per cent of copper, which will be mined first, and 18,000,000 tonnes of sulphidic ore with 1.7 per cent copper content. Micuma's capital is held: 25 per cent by the Republic of Mauritania, 25 per cent by the Bureau de Recherches Géologiques et Minières Français, and the rest by various banking and mining concerns.

The Crowsnest Pass Coal Co. has announced an order for coking coal for the Japanese steel industry, which, at 225,000 tons, is almost double the amount of previous Japanese orders for western Canada coal. Shipments will be over a period of one year, starting April 1 next.

The science correspondent of the *Rand Daily Mail* reports that rare blue diamonds mined in South Africa may be used as thermistors as they are able to record minute temperature changes, as small as 1/500th of a deg. They may play an important part in space ships, to record minor changes in temperature and detect radiation, and also in medicine, giving almost instantaneous temperature readings.

New floodlighting has been installed by the A.E.I. Lamp and Lighting Co., on the railway sidings and general outside working area at Hawthorn Colliery, Northumberland. Lighting is by 95 (EL 6101) M25 floodlighting projectors mounted on six 100 ft. Tubwright high towers. Consultant for the work was British Reinforced Concrete, Newcastle

It is reported from Vienna that extensive new bauxite deposits have been found in the Nyirad district of western Hungary. The seam is said to be 12 to 13 m. thick.

A new company AMMI S.p.A., has been set up in Rome for the exploitation and processing of metallic ores. AMMI will have a share capital of 136,000,000 Lire, shortly to be increased to 5,650,000,000, majority shareholders being the Italian State, with insurance organizations and the Banco di Napoli also participating. The new company is to succeed the now broken-up Azienda Minerali Metallici Italiani (AMMI), a leading zinc producer, which has a share capital of 3,000,000,000 lire, but lost two-thirds during 1957 and 1958.

Mr. W. T. Swenson, assistant vice-president of Anaconda Co. of Canada, has stated that the company is developing a large iron ore deposit at Nakina, about 190 miles northeast of Port Arthur, Lake Superior. He added that reserves amenable to magnetic concentration occur within a 22-mile belt of intricately folded metamorphic rock, but did not disclose tonnage, or production date.

The American Smelting and Refining Co., has awarded a contract to the Western-Knapp Engineering Co. of San Francisco for the construction of a \$17,000,000 flotation concentrator at the site of the new mining open pit copper operation, known as the Mission Project, near Tucson, Arizona. ASARCO estimate the cost of starting Mission Project at over \$40,000,000, and the Western-Knapp Co. will begin work about March 1. Copper production, which is expected to be about 5,400,000 tons of low-grade ore annually, should begin in September, 1961.



Metals and Minerals

Fabrication of Beryllium in the U.K.

Beryllium, like zirconium, is a metal which submits very reluctantly to the demands of the metal manufacturer. Special techniques are necessary to overcome technical difficulties at every stage of production and to eliminate the toxic hazard which powdered beryllium and its salts may present. Having regard also to the fact that beryllium is not particularly abundant and extraction from its ore, beryl, is a laborious and costly process, it is evident that only the recognition of the wrought metal as potentially a very desirable engineering material would have triggered off the long and expensive effort needed to bring it into commercial production.

Such a demand arose in the United Kingdom when forward planning by the Atomic Energy Authority revealed the need for a new fuel sheathing material. Metals used for fuel cans must fulfil very exacting requirements. In all reactor operating conditions, the can must safely contain the fuel and dangerous radioactive fission products; be compatible with both the fuel and the coolant; be as "transparent" as possible to neutrons; and allow efficient transfer of heat to the coolant.

In current gas-cooled reactors, special magnesium alloys provided the answer. The next steps in improving the efficiency of gas-cooled reactors, however, involved operating at much higher temperatures—perhaps up to 600 deg. C. At these temperatures magnesium alloys are not suitable, so a metal was needed which had not only all the useful properties of magnesium alloys, but retained them effectively at much higher temperatures. Of all the metals evaluated, beryllium was much the most promising, and the U.K.A.E.A., therefore, specified this metal for use in fuel sheathing in its experimental gas-cooled reactor.

Largely because of its exceptional research and development resources and long experience of nuclear engineering requirements, I.C.I. Metals Division was entrusted with the task of producing the wrought beryllium for these cans. I.C.I.'s plant at Witton uses as its raw material imported flake and pebble beryllium. This plant is the first in Europe to be designed for processing large quantities of beryllium from raw material to wrought product. It will operate as a research production unit with an initial output of about 7 tons a year. The plant incorporates all the recommendations of the safe processing of beryllium based on U.K.A.E.A. and U.S. experience.

The first plant in Europe for machining beryllium has become operational at the Whitley works of Armstrong Whitworth Aircraft, a member of the Hawker Siddeley Group. Supplies are received from the nearby I.C.I. works and are machined in a special building in which the utmost precautions have been taken to avoid risks to health. About £3 per employee has been spent for every £1 on normal manufacturing facilities. Swarf dust is finally removed from the plant in 20-lb. containers, which are then placed in 300 lb. boxes of concrete, rubber and other materials,

and disposed of down disused mines or in the sea. Larger swarf shavings are returned to I.C.I. for possible remelting.

As reported in our issue of July 10, 1959, p. 35, a company known as Consolidated Beryllium Ltd. was formed last year by the Imperial Smelting Corporation, the U.K. subsidiary of Consolidated Zinc Corporation, and the Beryllium Corporation of Pennsylvania, to produce nuclear grade beryllium metal and beryllium-copper master alloy as raw materials for sale to fabricators both in the U.K. and in Europe. It would operate the beryllium metal plant. It was announced that the new company under construction at Avonmouth, which was scheduled to start small scale production at the end of 1959 and to be expanded in accordance with future demand. In view of possible future requirements, the new company is planning the largest beryllium metal plant in the world, to enable construction to begin without delay as soon as a large-scale demand develops. Thus future U.K. supplies of this potentially very important metal are assured.

The U.K.A.E.A. state that the selection of beryllium as the major canning material for the advanced gas-cooled reactor represents the first commercial application of the fabricated metal in the U.K. Four firms are now actively engaged in the production and fabrication of the metal on an industrial scale and facilities for the development of fabrication techniques and for testing beryllium are available at three U.K.A.E.A. establishments. A fourth facility, which is to be used for the production of fuel elements, is being commissioned at present.

The ultimate aim of all beryllium work proceedings within the Development and Engineering and Production Groups and at A.E.R.E., Harwell, is the production of fuel elements which will retain their integrity over an economic life. This requires the achievement of a satisfactory compromise between three inter-dependent variables, namely design, mechanical properties and corrosion properties referred to the service conditions of the various components in the reactor. Clearly, the effect of irradiation on these properties is of primary importance. The assessment of the metal has required both out-of-pile tests and tests at the anticipated levels of irradiation in AGR. The research programme is concerned specifically with the production of components for the first reactor charges, but also aims to cover a wide field of endeavour from the point of the future development of the metal.

In view of the toxicity of beryllium metal and its compounds, it is essential to protect the health of those engaged in handling them by ensuring that the concentration of beryllium in the air of workshops and laboratories does not exceed 2 millionths of a gram per cu. m. The methods of analysis usually employed are time consuming and would not give sufficient warning of a sudden or unexpected increase in the concentration of beryllium. Research workers at the A.E.R.E. Chemistry Division

Woolwich Outstation have developed a fully automatic monitor which will give the desired results in 60 sec.

This monitor could be used for the determination of a number of elements apart from beryllium, and it is considered to have potentialities in the monitoring of atmospheres for such elements as quicksilver, lead, chromium, manganese, silicon, arsenic, antimony, zinc and copper. Further details can be obtained from the Patents Exploitation Officer, U.K. Atomic Energy Authority, 11 Charles II St., London, S.W.1.

Outside the nuclear engineering field, beryllium is potentially interesting to aircraft engineers because of its combination of low density and high elastic modulus. Reports indicate that it has already been used in the U.S. for components in high-speed aircraft, guided missiles and guidance systems. The technical and economic obstacles in the way of large-scale utilization, however, are considerable. Because of its comparative scarcity and the elaborate techniques involved at all stages of production, beryllium is inevitably an expensive metal. Raw beryllium costs about £20/lb. and the present quoted price for wrought beryllium is about £160/lb. As increasing demand and/or technological improvements reduce the price, beryllium's potential as an important new engineering material will be more clearly seen.

FIRM CADMIUM MARKET

In view of the firm conditions prevailing in the world cadmium market, Belgian producers have again increased their selling price. In the U.K. cadmium of Belgian origin is now quoted at 10s. 5d.-10s. 6d. per lb. as compared with 10s. 3d. previously. U.K. and Empire material still continues to be quoted at 10s.

GREEK ALUMINIUM PLANT

A French expert has arrived in Athens to study on the spot the setting up of an aluminium plant in Greece using local bauxite. It has been stated that favourable conditions for such an industry would be created in a few years' time by construction of the Archelios River hydroelectric power project. This project is expected to produce power at prices competitive with that used by aluminium industries in other countries.

£1,500,000 ALUMINIUM MILL

The largest aluminium rolling mill of its type in Western Europe has been ordered by James Booth Aluminium as the first part of a £5,000,000 programme of re-equipment and expansion. The mill will cost about £1,500,000 and is expected to come into operation some time in 1961. A 50 per cent interest in James Booth Aluminium was acquired last month by the Kaiser Aluminium and Chemical Corporation. It was then announced that James Booth Aluminium, a

new company formed by the Delta Metal Co. to acquire the aluminium and light alloy interests of its subsidiary, James Booth and Co., would have an issued capital of £10,000,000, of which Delta would contribute £5,000,000 by existing assets and Kaiser £5,000,000 by additional finance.

NICKEL EXPORT LEVIES

The French nickel mining and refining company "Le Nickel" has approached the New Caledonian authorities to obtain a cut or cancellation of export

duties levied on nickel mattes and ores. The company's chairman, M. Rene Mayer, is at present in Noumea, where he has asked the territorial parliament to make concessions in this field and thus share in the company's efforts to bring New Caledonian nickel down to competitive levels on the world market. The company was engaged for several years in a very large modernisation and investment programme, aimed not only at raising production but also at lowering costs by modern processes and by using electric power from a recently built power station on the Yate dam instead of Australian coal.

COPPER • TIN • LEAD • ZINC

(From Our London Metal Exchange Correspondent)

The week has been featured by the narrowing of the backwardation in the copper market with a consequent lowering of the general price level. In spite of this, a better tone has developed in the lead and zinc markets and a backwardation has been firmly established for the former and the contango, in the case of the latter, has narrowed to vanishing point.

COPPER PRICE DECLINE—WAS IT OVERDONE?

Stocks of copper in official L.M.E. warehouses showed a substantial increase of 650 tons at the beginning of the week and as this was copper which had been attracted into warehouse by the high prices ruling for nearby metal, it was sufficient to break the large backwardation. As is always the case when a backwardation is being eliminated, or in this case lessened, the general price level falls but it has been interesting to see that a good deal of substantial buying of forward copper has taken place and the drop has been less than some people had prophesied.

We say the backwardation is being lessened in this case as the general opinion is that a backwardation of some dimensions is likely to exist for some time to come. Consumer offtake has been good and it is understood some Eastern European countries are again showing an interest in the market now the price structure has altered so appreciably. The Belgian copper price has been reduced from approximately 33.10 c. per lb. to 31.75 c. per lb. New York or Antwerp, a move which was to be expected in view of the fall in the London Settlement price.

In the U.S. the strike situation remains unchanged except that a settlement has been reached in the White Pine dispute. The Phelps Dodge plant at Laurel Hill still being idle but the dispute between the company and the Railroad Brotherhood in Arizona has not impeded operations. With the lowering of prices in London a weaker undertone has developed on Comex, especially

for the nearby months and the availability of scrap has increased to such an extent that the No. 2 scrap price has been reduced from 25½ c. per lb. to 25¼ c. per lb. and it seems possible that customs smelters may reduce their price of 35 c. per lb. at the end of the month.

It seems to some people that this weakness in the price structure is somewhat premature as the month of March may well prove to be a time of shortage with normal supplies still not flowing freely. The dealers' market is also weak with March delivery wirebars being offered at 36 c. per lb. without any buyers and it is also reported that there is no business for delivery periods beyond that.

TIN FEATURELESS

The tin market has once again been featureless with current demand running at average levels and stocks in official warehouses falling by 70 tons to a total of 8,232 tons. In Singapore turnovers continue to be above average and the Eastern price on Thursday was equivalent to £798½ per ton c.i.f. Europe.

NEARBY LEAD-ZINC OUTLOOK FIRM

The lead and zinc markets have both shown a tendency to firmness and in the case of lead the scarcity of nearby metal has now been reflected in the establishment of a backwardation and it seems probable that this will continue as supplies of metal to U.K. consumers are still being affected by the voluntary restrictions on availability self-imposed by the producers.

In zinc the position is a little easier but, here again, it seems possible that the availability of extra metal due to the removal of availability restrictions, will not reach the market for some weeks to come and that in the meantime a backwardation may re-appear unless further supplies of Western hemisphere material reach this country as can quite easily be the case.

In this connection, it is interesting to look at the progress report on the imports into the U.S. of lead and zinc for the period up to February 19 which covers the first half of the current quota period. In lead, the Australian quota has been completely filled whilst the Mexican quota is almost filled and the Canadian quota is half-filled, but against this both Peru and Yugoslavia have only supplied about 25 per cent of their quotas which seem to indicate that metal is being diverted to other markets.

In the case of zinc, both Mexico and the Belgian Congo have only supplied very small tonnages, whilst Belgium itself is also lagging behind. Canadian deliveries are up to schedule and the Italian quota is almost completely filled: this latter is not surprising as Italian exports consist entirely of high-grade material which is short in the United States at the moment.

The Indian Government has decided to increase the imports of zinc by increasing the quota of established importers by 10 per cent during the current half-year.

BRITISH METAL STATISTICS—1959

The British Bureau of Non-Ferrous Metal Statistics have published U.K. consumption and year-end stock figures for 1959—in respect of copper, tin, lead and zinc. They are summarized below with comparative figures for 1958.

The figures for lead, zinc and tin showed continued activity in industry

	Consumption		Stocks	
	1959	1958	1959	1958
Copper	633,166	667,852	55,005	60,936
Lead	345,903	336,053	48,035	46,984
Zinc	335,890	306,996	37,162	35,460
Tin	21,735	20,413	11,528	10,545

and although the total copper consumption for the year showed a fall, this fall was appreciably less than the non-repeated orders for rod which were a feature of 1958.

Closing prices are as follows:

	Feb. 18		Feb. 25	
	Buyers	Sellers	Buyers	Sellers
COPPER				
Cash	£269	£269½	£253½	£254
Three months . .	£249½	£249½	£241½	£242
Settlement . . .	£269½		£254	
Week's turnover	9,450 tons		14,425 tons	
LEAD				
Current ½ month	£74½	£74½	£74½	£74½
Three months . .	£74½	£74½	£73½	£74
Week's turnover	8,200 tons		8,425 tons	
TIN				
Cash	£793½	£794½	£789	£790
Three months . .	£793½	£794½	£788	£788½
Settlement . . .	£794½		£790	
Week's turnover	825 tons		510 tons	
ZINC				
Current ½ month	£86½	£87	£87½	£87½
Three months . .	£87½	£87½	£87½	£87½
Week's turnover	6,475 tons		6,425 tons	

Mining Finance

Carrot for the S.A. Diamond Industry

To the South African diamond industry, the Precious Stones Amendment Bill, which has received its second reading in the Union Parliament, will be a welcome measure—although it is doubtful whether its effect will be significant in any sense.

As a whole, the measure is designed as a stimulus to the industry's expansion. Among other things the Amendment Bill provides for the alignment of the diamond industry with the gold mining industry on such matters as the negotiation and fixing of lease considerations, and the provision for capital expenditure write-offs in the taxation system. It is believed, however, that the implementation of these provisions will be of limited financial importance to the diamond companies, though as a token of appreciation, as it were, they will obviously be welcomed.

Probably the most important provision is that relating to the opening-up of Namaqualand for prospecting. When the original Precious Stones Bill was enacted in 1927, prospecting in this area was prohibited as part of the effort to stabilise prices by state control. There seems to be little doubt that the unexplored parts of Namaqualand contain potentially diamondiferous areas, though there is no guarantee that payable deposits will be found. What is important is that the companies are to be given a chance to find out.

Moving the reading of the Bill, Sen. J. de Klerk, Minister of Mines, said that during recent years, South Africa's proportion of world diamond production had become less and less. As long as the present marketing arrangements for diamonds remained in force, both demand and price would remain reasonably sound, but there was no guarantee that in 100 years time gem diamonds would be as much in favour as at the present time. The most sensible policy for the Union, therefore, was to stimulate production while the demand was high.

A further indication of the government's intentions may be given in the forthcoming budget. If any real financial concessions are to be made in addition to the recent granting of the right to offset prospecting expenditure against profits for tax purposes, it may be that the Finance Bill rather than the present Amendment Bill will be the chosen medium.

BIG INCREASE IN CHARTERED'S PORTFOLIO VALUE

Even in a year when big increases in portfolio values were to be expected, Chartered's performance in this field during 1958-9 stands out as exceptional. From £28,327,000 at the beginning of the year, the market value of the quoted investments had risen to £36,371,000 by September 30 last. There has been further appreciation since that date, too, and Lord Robins, the President, will probably give an up-to-date valuation at the meeting on March 17.

The most important changes in the group's portfolio during the year were the acquisition of 700,000 shares in Union Corporation (by a share exchange transaction), and the taking-up of a 10 per cent sub-participation in the Western Deep loan syndicate. The latter, in particular, is notable as an unusual instance of a com-

pany not immediately concerned with Kaffir financing taking part in the early stages of the launching of a new South African mine. It may well be that Chartered will repeat this sort of arrangement in the future, as part of its policy of diversification in preparation for the day in 1986 when the Rhodesian mineral royalties revert to the government.

Lord Robins' advance statement is on p. 248.

WHERE'S THE SENSE?

It seems almost incredible that a mining company can remain in existence under a tax system which levies rates like 115 per cent and 93 per cent of earnings. That San Francisco Mines of Mexico continues to perform this feat year by year is astonishing, and it is not surprising that Mr. A. V. Conrad, the chairman, delivers an annual protest against this inequity in his statement to shareholders.

What is surprising is that nothing has yet been done by the Mexican government to alleviate the position. These confiscatory rates of tax arise from the fact that a large proportion of the government's toll is levied on the gross value of minerals produced, rather than on profits. Quite apart from the clearly unjust fact that this involves high rates of tax in poor years and low rates in good years, the system is clearly damaging to the long-term prosperity of the nation. The effect of a levy on gross profits—i.e. before deducting costs—is to raise the calculated pay limit of the mine as a whole. This in turn means that a substantial amount of metal is left in the ground, possibly for ever, which would otherwise go to swell Mexico's national income. It needs only a simple calculation to show that from the tax point of view only, it would be more profitable for Mexico to increase its normal income tax rate and to abolish the "gross" taxes.

This question is obviously the one which overshadows all others when considering the San Francisco company. From other standpoints, the year to September last was reasonably satisfactory, bearing in mind the difficult situation of lead-zinc producers in general. Certainly Mr. Conrad is not despondent. The policy of the company has been to continue at full capacity, in spite of the weakness of the market, in the hope that eventually it will prove possible to sell the accumulated stocks at a profit. This involves tying up a substantial amount of capital in stock financing—indeed, this was the primary reason for the non-declaration of a dividend this year—but in the long term, the policy should be vindicated.

A.S.A.I.C.'S PORTFOLIO

Perhaps the item of most interest in the 1959 annual report of American-South African Investment Company is the full year-end break-down of the portfolio. During the year earnings totalled 9s. 7d. per share, of which only 2s. 10½d. was paid out by way of dividend. The remainder has gone to building up the portfolio, which was worth more than £13. 15s. per share at the year-end, compared with £10 14s. 8d.

The alignment of the investments has changed little over the twelve months since the last full report. The only shares to dis-

appear altogether from the portfolio are S.A. Land and, surprisingly, Libanon, while the newcomers, apart from Leslie and Bracken, are Western Deep, De Beers and Natal Ammonium. None of these, with the exception of De Beers, is a particularly large holding.

More noticeable is the way in which the holdings in mines which already appeared in the portfolio have altered during the year. The largest single increase is in St. Helena, the investment in which has quadrupled numerically—from 42,400 shares to 166,000—and increased from £106,000 to £681,000 in value.

A more surprising name to find among the list of shares with a greater representation is Marieval, one of Union Corporation's East Rand producers. The shareholding in this case has risen from 12,100 to 83,000. Other increased holdings include Grootvlei, F. S. Saaiplaas, Harmony, the Presidents and Western Reefs.

Apart from the shares which have been eliminated from the portfolio, there are no reductions of any importance in any of the investments. There are several, however, which have not been augmented in spite of the new money which had to be invested. Both the O.F.S. market leaders, Free State Geduld and Western Holdings, come into this category, as do East Rand Proprietary and Welkom.

HIGHER KILEMBE COPPER PRODUCTION PLANNED

Kilembé Mines, which raised its output of copper in Western Uganda from an initial rate of 7,000 tons to 12,000 tons last year, is scheduled to produce between 14,000 and 15,000 tons of copper during 1960, said Mr. A. E. Pugsley, the mine's general manager, in Kampala. He revealed that it was planned to expand production to 16,000 tons of copper a year.

He said the expansion programme had been undertaken because Kilembé was only a low-grade producer with an ore content of two per cent, against three to 4½ per cent at the big Rhodesian mines.

Investment at Kilembé totalled nearly £9,000,000 at the end of 1959 and another £1,000,000 to £1,500,000 would be needed to complete the present expansion programme. Of the equity capital, 70 per cent was provided by the Canadian company Frobisher Limited, 20 per cent by the Colonial Development Corporation and the remainder by the Uganda Development Corporation.

ANOTHER GOOD YEAR FOR MESSINA

The report and accounts to September 1959 of Messina (Transvaal) Development Company mark another year of success in the history of this vigorous company. Taxed profits rose from £687,141 to £1,006,493, making possible an effective increase in the year's dividend rate to 9s. per unit. In addition, the board is proposing a four-for-one scrip issue to members of record on May 20.

The increased profits derived mainly from better results at Messina, where both the grade of ore broken, and the rate of production were higher. At Umkondo, Messina's other productive copper mine,

the head grade of ore milled fell further during the year, but the effect was neutralized by increasing production. Results at Mangula, in which Messina retains a large interest, were detailed in this column last week.

This, of course, is now history. Of more importance to a company with Messina's expansionary outlook is its prospecting and development programme, and here again it is good to be able to report excellent progress. At Alaska, for example, a smelter and refinery is to be built to treat both Mangula's concentrates, which have previously been railed for treatment at some expense, and material from the Alaska mine itself, which is due to come into production by the end of September next. The erection of the smelter is already well advanced, and shaft-sinking and dewatering are under way in the mine itself.

Work has also been pushed ahead on the copper occurrence at Sanyati. Over 2,000 feet of development were accomplished from the Bradfield shaft during the year, all within the Copper Queen ore-body. Values were satisfactory, and during the current year the tempo of exploration is to be stepped up. The Beardmore scheelite property is still on a caretaking basis, but there has been activity at Lomagundi (Nickel), Iron Mask (Pyrite), Darwendale (Chrome) and Lucky Leap Year and Tufa (Limestone).

Messina stock units are currently quoted at around 136s. to yield 6½ per cent. This would certainly not seem to be an overvaluation of the probabilities—not to mention the possibilities.

NEW R.S.T. PROSPECTING COMPANY

Bamangwato Concessions, a new prospecting company under the controlling interest of R.S.T. Exploration, has been registered and the deed of concession has been signed for the purpose of prospecting in the Bamangwato tribal area of Bechuana-

land. The nominal capital of the company is £200,000.

Prospecting in the area has now started and should there be any significant discovery, mining rights may be exercised by Bamangwato Concessions and any mining companies formed by it. Royalties would be payable to the Bamangwato tribal authority.

Gold Fields Increases Alumasc Interest.—Consolidated Gold Fields is exchanging 37,701 Gold Fields shares for a further 46,500 shares of Alumasc Ltd. This will increase the Gold Fields group interest in Alumasc from 75½ to 87 per cent.

Blinkpoort Pays More.—Blinkpoort Gold Syndicate, whose income derives almost exclusively from a large shareholding in Free State Geduld, earned a net profit of £553,607 in the year to September 30 last, £190,149 higher than in the previous year. Two dividends totalling 4s. 4½d. were declared, compared with 2s. 10½d. in 1957-8. Meeting, Johannesburg, March 1.

BOARD CHANGES

Mr. D. T. Lewis has retired from the board of The Pahang Consolidated Company. Mr. Lewis was associated with the company in its earliest years, and had been a director since 1927.

The Proprietors of British Patent No. 759621 for "IMPROVEMENTS IN AND RELATING TO ROLLER GUIDE ARRANGEMENTS FOR HOISTS, PARTICULARLY FOR HAULAGE SKIPS AND CAGES USED IN SHAFT HAULAGE IN MINES," desire to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder. Further particulars may be obtained from Marks & Clerk, 57 & 58 Lincoln's Inn Fields, London W.C.2.

SOUTH AFRICAN GOLD AND URANIUM PRODUCERS

Comparison and analysis of results for the calendar years 1959 and 1958

Heading		Calendar Year	Rand Cos.	Klerksdorp Cos.	O.F.S. Cos.	Total
Tons milled:	Millions	1959	50.1	7.6	12.8	70.5
		1958	48.6	6.4	10.5	65.5
Ounces produced:	Millions	1959	11.0	3.0	5.6	19.6
		1958	10.4	2.5	4.3	17.2
Grade per ton:	Dwt.	1959	4.40	8.00	8.70	5.57
		1958	4.23	7.91	8.23	5.23
Working costs per ton:	s. d.	1959	39/11	57/9	59/7	45/4
		1958	43/1	54/6	59/11	46/11
Working profits:	Gold £m.	1959	38.4	16.1	31.6	86.1
		1958	24.6	14.1	22.7	61.4
Working profits:	Uranium £m.	1959	10.0	11.5	7.3	28.8
		1958	19.8	11.5	6.4	37.7
	Total £m.	1959	48.4	27.6	38.9	114.9
		1958	44.4	25.6	29.1	99.1
Dividends declared:	£m.	1959	18.7	10.0	16.7	45.4
		1958	19.0	10.3	13.3	42.6
Non-European employees at end December:		1959	230,000	49,000	76,000	355,000
		1958	227,000	40,000	62,000	329,000
Number of Cos. included:		1959	38	7	10	55
		1958	37	7	10	54

Note:

When comparing the Working costs and Working profit figures, it should be noted that from 1/1/1959 Uranium mining and milling costs are no longer included under the heading "Working costs" but are charged against Uranium revenue.

MARKET HIGHLIGHTS

Sharp fluctuations, out of proportion to the actual amount of business being done, again unsettled the South African Gold share market last week.

After the previous Wednesday's setback, a recovery movement set in which after pausing immediately in front of the weekend gained strength on the following Monday. On that day sharp price gains were recorded throughout the list of prices. Free State Geduld and Western Holdings, for example, both spurted 5s. to 172s. 6d., thus regaining all of the earlier losses.

But the kaffir market began to look a little uncertain again on the Tuesday, and Wednesday saw a fresh setback that hit all sections of the Stock Exchange. Among Golds, Western Holdings topped 4s. 4½d. to 167s. 6d. and Free State Geduld relapsed to 168s. 1½d. again. A withdrawal of Johannesburg support was considered largely to blame for the reaction, but there was also some selling from Continental centres nervous about Wall Street's failure to maintain the previous week's rally.

Losses in the Finance group lowered Central Mining 2s. 6d. to 81s. 9d. and Gold Fields another 1s. 9d. to 85s. 9d. Platinums and Diamonds also lost ground, particular weakness being seen in De Beers which dropped 5s. 7½d. to 192s. 6d. despite the previous strong optimism felt over the 1959 results due next month.

Just how long these fluctuations in mining shares are going to continue depends almost entirely on the course of Wall Street. But it is worth repeating the point made here last week that a holder of good-class gold investments should have little to fear in the long run.

Coppers, which had not shared in the general recovery movement to any real extent, became very depressed by mid-week. Fresh fears about Wall Street were aggravated by a metal price which at last began to reflect the implications of much freer copper supplies now that work has been resumed at most of the U.S. mines.

Continental selling of these copper shares was reluctantly taken by an uneasy London market. Nchanga (63s. 9d.), Rhokana (63s.) and Rhodesian Anglo American (83s. 9d.) all lost two or three shillings. Even Messina came back 2s. 6d. despite the annual report with its news of a four-for-one scrip issue. And the generally encouraging annual report of Chartered did little more than stem the selling, the shares easing to 106s. 3d.

While all this was going on, one or two buyers of copper shares appeared at the lower levels. The view was taken that the fall in prices had been overdone in the light of current high earnings and expectations of increased dividends this year.

The Tin share market once more held aloof from upsets elsewhere. Prices were generally well maintained and although there were few fresh buyers, there were equally few investors wanting to sell. Lead-zincs also behaved fairly well, one of the few dull spots being in San Francisco Mines which eased to 19s. 10½d. after publication of the annual report.

Consequent on the sale of Thorium Ltd to Rio Tinto and Dow Chemie A.G., Mr. R. W. Wright, Mr. J. R. Poole and Mr. J. R. Robinson have been nominated to the Thorium board by Rio Tinto, and Mr. C. Benson Branch, Mr. R. H. Gregory and Dr. J. D. Head by Dow Chemie.

THE BRITISH SOUTH AFRICA COMPANY

CAPITAL AND RESERVES EXCEED £45½M.

SATISFACTORY TRADING RESULTS

GROUP'S ROLE IN ASSISTING UNDEVELOPED COUNTRIES

LORD ROBINS ON THE MONCKTON COMMISSION

The 62nd annual meeting of The British South Africa Company will be held on March 17 at The Chartered Insurance Institute, 20 Aldermanbury, London E.C.2.

The following is the statement by Colonel The Lord Robins, K.B.E., D.S.O. (the President), which has been circulated with the Report and Accounts for the year ended September 30, 1959:

As foreshadowed in my speech last year, Sir Charles Cumings resigned from the Board on July 31 last and was succeeded as the Company's Resident Director in Africa by Viscount Malvern, while executive and administrative duties were assumed by two Joint General Managers, Messrs. E. S. Newton and R. H. C. Boys, responsible direct to the Board.

During the year, as members are aware, an Agreement was concluded between this Company, one of its subsidiaries (Cecil Holdings Limited) and Union Corporation Limited which gave Cecil Holdings a substantial interest in Union Corporation's enterprises and involved the issue to a subsidiary of the latter of 455,000 stock units of The British South Africa Company. The chairman of Union Corporation, Sir Charles Hambro, joined the Board of The British South Africa Company and I was elected to Union Corporation's Board.

Mr. W. M. Robson, who has for many years had a close connection with Central African territories, was also elected to our Board, and I am sure that members will welcome these two new directors.

Before dealing with the accounts in detail, may I say that The British South Africa Company itself continued during the year to operate as an Overseas Trade Corporation under the United Kingdom Finance Act, 1957, and the scope of its activities is strictly limited by that legislation. In the course of this statement, therefore, I shall use the term "Group," which must be taken to cover the parent company itself or any of its subsidiary companies with whose operations I may be dealing.

Accounts

Turning now to the Report and Accounts, I am glad to say that owing to the satisfactory levels at which the prices of base metals have been maintained during the past year—and particularly the price of copper—our mineral revenue from Northern Rhodesia reached a figure of £9,395,827, after allowing for the Northern Rhodesian Government's 20 per cent share, but before the deduction of Federation income tax.

Our Investment Income shows a small decrease when compared with the previous year by reason of the fact that the dividends which we received from the Northern Rhodesian copper mines were related to a period when the price of the metal was considerably less than it had been for many years. Our Estates profits have suffered from adverse weather conditions and reductions in the prices obtainable for certain of our products. Both of these sources of income should show an increase in 1960.

You will see then that the Consolidated Net Profit of the Group before taxation at £11,439,026 shows an increase over the previous year of £3,467,829. The amount of £4,854,888 charged in the Profit and Loss Account for taxation would have been higher but for our qualification as an Overseas Trade Corporation, and the net profit after taxation stands at the satisfactory figure of £6,584,138 against £4,363,217 in the previous year.

The balance of unappropriated profits at September 30, 1958 was £2,279,085, which together with the net profit for the year under review makes a total of £8,863,223 available for disposal. Of this amount the sum of £784,367 has been retained in the accounts of the subsidiary companies, an increase of £417,642 over the previous year due to the fact that the accounts of the largest subsidiary—The British South Africa Company Investments Limited—covered a period of six months in 1958 whereas in 1959 they covered a full year.

After taking account of this retention, the formation expenses of subsidiary companies written off, and the special and interim dividends the Directors propose to allocate the balance as follows:

Final dividend of 4s. 6d. per stock unit or share less income tax	£2,477,318
Transfer to General Reserve	£2,000,000
Balance of unappropriated profits to be carried forward	£2,395,293

The interim dividend of 1s. 6d. which was paid on October 9, 1959, together with the final dividend now recommended will make a total of 6s. 0d. per stock unit or share.

Consolidated Balance Sheet

The capital and reserves of the group now stand at £45,590,660 an increase of £4,909,683 over the previous year. Part of the increase is accounted for by the issue to which I have already referred of 455,000 stock units to Union Corporation Limited for a total premium of £1,658,750. The remainder is largely due to the proposed additions to be made to the General Reserve and unappropriated profits.

On the assets side of the balance sheet it will be observed that there has been a small increase in the amount of fixed assets. Current assets exceed liabilities by £2,997,083 against which the group had outstanding commitments of approximately £2,360,000 as shown on page 14 of the Report and Accounts.

Investments

I now propose to deal briefly with the Group's investments.

In paragraph IV of the Directors' Report the investment position of the Group has again been set out in comprehensive form, and I hope that members

will find that information useful. It will be observed that the overall book value of the Group's investments has, during the course of the year, increased by about £4½ millions, of which quoted investments account for some £2 millions and unquoted investments for approximately £2½ millions. Attention has been drawn to certain of the more important of the items which account for these increases. It should not be forgotten, however, that the issued capital of the parent company was also increased during the year.

The valuation of the quoted investments showed at September 30, 1959, an appreciation of more than £11½ millions, of which the investments held by The Rhodesia Railways Trust accounted for over £4 millions. Some further appreciation in the mining investments—still the major part of the Group's business—has occurred since the date of the Balance Sheet, and I hope to be able to give you at the Annual Meeting an up-to-date valuation, and some indication of the further diversification which has occurred since the end of September last.

The supervision of these invested funds and the selection of channels for the employment of further funds as they become available are a major preoccupation of the Boards of our investment subsidiaries. The growth and diversification to which I have drawn your attention serve to strengthen the financial position of the Group and enable it to fulfil the function of a finance house principally concerned with the development of the Federation of Rhodesia and Nyasaland.

Mining

The Federation, and in particular Northern Rhodesia, must always have first priority as a field of investment, and in addition to its interest in the Copper Mines the Group has made substantial contributions to the financing of the prospecting companies which are searching for further mineral deposits.

Such operations on a large scale were continued throughout the year, primarily by Companies controlled by the large Mining Groups operating in the Territory. Moreover I am glad to report that we recently satisfactorily concluded negotiations with the prospecting companies controlled by the Rhodesian Selection Trust Group of Companies whereby their prospecting rights have been extended to December 31, 1971 with certain rights thereafter.

Furthermore, Chartered Exploration Limited, a prospecting company in which the Group has a large interest, continued to expand its organization and activities and has just about reached its optimum. This Company is also conducting prospecting operations for Kasempa Minerals Limited in the area known as the 'Kasempa Salient,' which became possible after The British South Africa Company had obtained the consent of the Government of the Barotseland Protectorate. It is to be hoped that in due course of time permission will be granted to prospect in Barotseland proper. In the meantime we are exploring the possibilities of arranging for prospecting to be undertaken in that part of the Balovale District west of the Zambezi River which was formerly part of Barotseland.

No new discoveries of any great value have been made recently, but, if anything should be found in the future, the Group will be in a good position to take an active part in financing such ventures, from which it would receive royalties up to and including the year ending September 30,

1986, and in which it would have a continuing interest as shareholders during the life of any such new mines.

Although I can report no spectacular discovery this year, it is gratifying to note that full-scale production was resumed at the Bancroft mine in the early months of 1959 and this materially contributed in raising the total copper production in Northern Rhodesia during the year under review to the record figure of over 475,000 tons.

Incidentally you might be interested to know that the total value of copper produced in Northern Rhodesia from the commencement of mining operations to date exceeds £1,000 millions.

Here I might say, too, that power began to flow to the mines from the Kariba Hydro-Electric scheme in January of this year and after Her Majesty Queen Elizabeth the Queen Mother has performed the opening ceremony in May this mighty project will develop to its full capacity to the great advantage of all branches of industry in the Federation.

Mazoe Citrus Estate

Recently the group purchased land adjoining the Mazoe Citrus Estate which is suitable for extending its citrus groves. Work has started on the irrigation canals that are required and some 10,000 new trees have already been planted. Under this expansion programme, the number of trees, which is already over 100,000, should be doubled within 6 years. Such an extension of our operations will require a larger water supply and in order to ensure this and in case we should have a series of years with low rainfall it is planned to heighten the wall of the Mazoe Dam by 10 feet.

Forestry

At the Imbeza Forest Estate the clear felling programme of the old established trees has been accelerated. The sawmill has been modernized and considerably enlarged in order to deal with the greater volume of timber. Each area that is clear felled will be replanted principally with pine trees.

At the Company's newer Charter Forest Estate near Melssetter 8,000 acres of land have already been afforested, mainly with pines, and it is intended to plant the remaining area of 25,000 acres over the next six years.

In order to provide an outlet for the Company's smaller timber, the John Mackay Box Company (Pvt.) Ltd., which has a modern factory in Salisbury, was recently purchased.

It would be convenient to mention at this point that at the two forestry estates of Border Forests (Rhodesia) Ltd., in which the Group has a substantial interest, the afforestation programme has almost been completed, and the total planted area amounts to 30,000 acres.

At present the bulk of the Federation's soft wood building timber is imported, but I greatly hope that these forestry projects, although long term, will eventually be able to make a substantial contribution to the country's requirements and will be a profitable investment for the Group.

Property

The property market in the Federation is not particularly active at present but the Directors of our Rhodesian subsidiaries

are always on the watch for any suitable sites which may come on the market although they are only willing to extend their holdings to really first class property in the large towns of the Federation.

Memorial to Founder in Lusaka

There is, as yet, no memorial in Northern Rhodesia to the Founder of The British South Africa Company. This is shortly to be remedied when the Company will present a replica of the equestrian statue "Physical Energy" to the Municipality of Lusaka. This statue which was designed by G. F. Watts, R.A., forms part of the Rhodes Memorial at Groot Schuur, Cape Town and the replica has been made with the permission of the Watts Trustees and of the Rhodes Trust.

The unveiling of the statue will take place in May this year.

The Rhodesian Milling Company (Pvt.) Ltd.

This Company, in which we have a half share, is operating at a satisfactory, although not spectacular profit. It is contemplating the amalgamation of its two mills in Salisbury by expanding one of its present mills in the industrial area there and closing the other. This would greatly reduce the overall running costs and enable the Company to deal with any possible future expansion in trade, but would be a costly operation, which could only be undertaken if the Company could be sure of continuing to earn good profits.

Before I conclude my review of the Group's affairs may I refer to one or two domestic matters.

Staff Pension Arrangements

For some time we have had under consideration the improvement of our staff pension arrangements and I am pleased to say that on October 1 last we established a new Scheme with more generous provisions and a new feature in that its funds are now under the control and administration of trustees. We have also introduced a Group Life Assurance whereby the dependents of an employee, who dies whilst still in service, receive a capital payment, in addition to any pension rights to which they may be entitled.

The Directors' Report records that since last year's meeting Dominion Registers have been opened in Southern Rhodesia and in the Union of South Africa. These Registers should prove to be of convenience to members resident in these countries and it is believed that the quotation of the Company's shares on both the Rhodesian and Johannesburg Stock Exchanges, and the establishment of the Registers will considerably broaden the market in these shares. This must ultimately benefit all members wherever they may be resident. As there has been some slight misunderstanding about these two Registers, I must explain that the Company's Statutes only permit the establishment of Dominion Register in those British Dominions in which business is conducted. A Dominion Register is quite a different thing from a Branch Register, and only persons actually resident in the Dominion concerned are entitled to have their holdings recorded on the appropriate Register. No such qualification is, of course, necessary in the case of Branch Registers, but the Company has no power to establish these.

Since we met last year I have myself paid three visits to the Federation and to South Africa, and I have also visited the East African Territories. Visits have also been paid to the Company's enterprises in Africa by Lord Salisbury, and Messrs. Grenfell, Annan, Wilson and Robson. Our colleagues Lord Malvern and Mr. H. F. Oppenheimer have visited us in London, as have the General Managers and the Resident Mining Engineer. These interchanges of personal contacts between Directors and senior officials have been of the greatest value to the Company and its subsidiaries.

The Monckton Commission

That concludes my review of our own affairs, but perhaps on this occasion when the Company has just reached its three score years and ten, I may be allowed to digress a little and to say a few words about Rhodesia in general. I have no desire to touch on politics, especially at this moment when the Monckton Commission is just about to leave for the Federation, but the development of undeveloped parts of the world is so very much in people's minds at the moment, that it would not be inappropriate for me to draw attention to the quite astonishing changes that have occurred in Rhodesia since The British South Africa Company, under the leadership of Cecil Rhodes, first took a hand in the development of that part of Africa. In the very sparsely populated areas where there were savage, and in some parts, warlike tribes, peace and order had to be established, communications made, towns built, agriculture improved, and a constant campaign carried on against disease. In 1899 the African population of Southern Rhodesia was 413,778 and it is now 2,630,000. In Northern Rhodesia the earliest figures, which are later than those of Southern Rhodesia, give a population in 1911 of 820,985, which has now risen to 2,280,000. This advance in the numbers, as well as in the conditions of the African peoples in the two Rhodesias, and the growth of industry and wealth which are opening up great opportunities for both Europeans and Africans, could not have been brought about but for the work done by the Company. In its early days it had to face difficulties which seemed almost insuperable, and a great debt is due to the courage and tenacity of the Pioneers. What has been gained must not only be maintained but improved. There are, I think, two lessons to be learnt from our experience; in the first place there must be potential wealth which can be exploited and, when once that has been established, conditions must be created so that development can be carried out for the benefit of all sections of the community.

Constitutionally, this year will be of great importance to the Federation. Towards the end of 1959 a strong team of civil servants was engaged in preparing statistics and facts for use by the Constitutional Meeting which is expected to be held in October, 1960. Meanwhile, the Commission under Lord Monckton's Chairmanship will examine and take evidence as to the operation of Federation within the present Constitution, and there can be little doubt that the findings of that Commission will be of considerable value, when the four Central African Governments meet the United Kingdom Government later this year to review the Federal Constitution and to decide whether, in the light of 64 years' experience of Federation, any changes are required in the functions and powers of the Governments concerned.

Machinery and Equipment

Highly Developed Metallurgical Microscope

The American Bausch & Lomb Optical Co. has recently developed a versatile metallurgical microscope called Dynoptic that frees the metallograph for solution of highly complex problems with no sacrifice in convenience or dependability. Simultaneously the microscope is claimed to provide a simple, precise, smoothly functioning tool for developing new and stronger alloys for specific applications and for many other industrial and scientific uses.

In the new metallurgical microscope, optical elements are ground and polished to tolerances of a fraction of a light wave, thus images obtained are exceptionally sharp. The proper combination of objectives can be chosen for the nosepiece which will permit examinations to proceed without delaying to change objectives. The rotosphere ball-bearing nosepiece revolves easily and smoothly with an absolute minimum of friction. Bearings are located around the perimeter of the nosepiece to distribute perfectly the weight throughout the entire circumference. A compensator distributes the pressure to all bearing points; precise positioning of the objective is achieved by a positive ball-stop.

The slightest movement of the adjustment focusing knob is instantly converted to vertical travel of the objective. The friction-free focusing mechanism minimizes operator fatigue and encourages accurate examinations. The large knob has one micron divisions, convenient in estimating the height of surface characteristics.

Both wandering out-of-focus and binding are avoided by the design of the adjustment slide which travels on specially selected pre-loaded ball-bearings in precision ground hardened steel raceways. The reflecting system utilizes a plane, coated glass reflector. For brilliance, and to reduce disturbing reflection, this reflector is vacuum filmed on both surfaces, giving better visibility at high magnification and reducing exposure in photomicrography. Easily positioned, it also provides oblique illumination.

Alongside, at right, an overall view of the Dynoptic microscope. Below, on this page, this British-made International LTD-20 crawler is giving a big performance removing overburden to reach clay deposits in South Africa. Handling a 10 cu. yd. struck capacity scraper it strips, carries and dumps 800 cubic yards of overburden over a 700 ft. travel cycle in a normal working day. In addition, clay deposits are removed by the same machine combination which is operated by J. J. Kirkness and Sons. Proven dependability in conditions and operations such as these are earning wide acceptance for these British tractors

Complete control is maintained over illuminating rays by using field and aperture diaphragms and an adjustable transformer to adjust lamp brilliance. The field diaphragm reduces stray light by restricting illumination to the area under observation. Illumination is always in complete balance between the two sides of the binocular body. Prism mounts are extremely strong to insure that prisms will remain in alignment and the two images perfectly superimposed.

HEAVY DUTY GREASE PUMP

The Hercules high-pressure pump is specially suitable for feeding heavy lubricants, if necessary, at high pressures, is capable of pumping bitumastic materials, and can operate at a maximum working pressure of 15,000 p.s.i.

The pump is foot-operated; it has a handwheel which is turned down approximately every 20 to 40 applications, to ensure that the lubricant finds its way into the pressure chamber. The output per

stroke may vary slightly with the type of grease; in the case of a grease of penetration 250, it is 2.3 grams per stroke.

The high pressure that can be developed by the pump is suitable for lubrication of chassis and machine parts and through long pipelines. The pump can also be used with positive dividers. By inclusion of relief or other suitable valves the pump can be adapted to operate with single line and dual line centralized lubrication systems. The weight is just under 50 lbs.

FIRE CHEMICAL HOSE

Recently developed for heavy duty, high pressure service is the Goodyear fire chemical hose (Goodyear Style 223), designed for wash-down duties and fire protection, including chemical foam, on tankers.

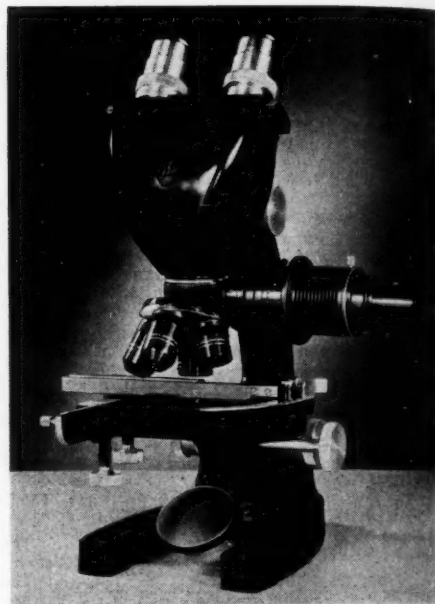
It is also claimed as suitable for the prevention, detection and control of fires in industrial sites, including mines. The hose, manufactured in 50 ft. or 60 ft. lengths, has a smooth 2½ in. bore which ensures maximum flow. Extremely flexible and light in weight, it has a guaranteed test pressure, on delivery of 400 p.s.i.

The tube consists of a smooth, seamless and non-porous synthetic rubber which has excellent resistance to ageing, whilst the reinforcement is of a braided, high tensile, synthetic fibre yarn. The synthetic rubber cover gives age and abrasion resistance in addition to withstanding the effects of oils, greased and dilute acids.

Although the hose may be used with several types of fittings, one coupling in particular—the internal expansion ring type, with pin-lug—is supplied and recommended. This is a permanent streamlined coupling available with fire hose threads.

NEW SWITCHGEAR AUXILIARY

The General Electric Co. Ltd. has introduced a new auxiliary switch of advanced design for linking mechanical movement with the associated electric control, protective, and alarm circuits.



This switch, designated Type SA, is of unit construction and composite assemblies for controlling up to twelve circuits can be built up. The contacts are silver plated with a rating of 30A and are suitable for breaking d.c. inductive currents of 18 and 25 amp. at 240 and 110 volts respectively.

Adjustments can be made to the angular position of each moving contact relative to the operating shaft by means of a simple vernier adjusting mechanism which forms an integral part of each moving contact assembly. This arrangement enables individual contact assemblies to be pre-set in any one of twenty-one effective positions, for a shaft rotation of 90°, for timing the making and/or breaking of the individual auxiliary circuits.

FILTER CLOTH DISCHARGER

Filter medium can be continuously removed from a drum filter, washed thoroughly, and then automatically replaced on the drum by a new patented device licensed by Peterson Filters and Engineering Co. Internal cloth blinding is said to be prevented and cakes too thin for other filters can be completely discharged without blow back.

Big advantage claimed for the unit is a water-filled loop that provides fluid tension for cloth. It is reported to be sensitive enough to compensate for the variable stretch in a filter cloth. Peterson spokesmen say that fixed diameter tension rolls tried in the past were unsuccessful because they were too insensitive and the cloth climbed to high side.

The cloth discharger has been in operation for over two years at U.S. Potash Company for recovering potash brine from mud tailing. The unit is designed for wide commercial application and provides not only the sluice discharge, but a dry discharge. It also eliminates the excess overflow water from the tension loop. The cloth is joined by a zipper for quick replacement when desired. Any suitable cloth can be used with or without seams. The Peterson cloth discharger can be designed to fit most types and sizes of drum filters.

CANADA ORDERS ANALYSIS EQUIPMENT

The first Canadian order for the titrometric analyser, manufactured by Electronic Instruments Ltd., valued at over \$10,000, has been received from the Canadian Aluminium Company Ltd. The first titrometric analyser to be supplied to North America was delivered a few months ago to the Esso Refinery, Baton Rouge, Louisiana, U.S.A.

The Canadian requirements created a particularly difficult problem because of the corrosive nature of the reagents required in the assay of the aluminium content of ore. Special arrangements for flushing and mechanically brushing the electrodes after each titration were made.

The analyser is intended to assay the aluminium content and the free alkali of five separate ore plant streams. To perform this, it automatically carries out a double end-point titration with two added reagents on each of the five streams. The ore liquor is highly corrosive and all taps, vessels and piping in contact with it are P.T.F.E. lined. To avoid scale formation, the complete sampling system is flushed frequently with water and acid. After every titration, the electrode system is cleaned by mechanical brushing under alternate sprays of acid and water.

Equipment Digest

The robust and compact Hydrovane air compressors manufactured by The Hymatic Engineering Co. Ltd., Redditch, Worcs., are now being fitted on the Ruston-Bucyrus 30 RB excavator. This heavy-duty machine has full pneumatic control and the air from the belt-driven Hymatic-Hydrovane compressor is used for actuating the main operations of hoist, crowd and swing. Ancillary controls including swing and propel brakes, steering clutches and the shovel dipper trip are also pneumatically operated.

A rotary, oil-sealed, sliding vane compressor, the Hymatic-Hydrovane is almost frictionless, stresses are low, and wear claimed as negligible. Air flow is stated to be smooth and continuous, and the compression cycle is more efficient than with any equivalent reciprocating compressor, giving a volumetric efficiency of up to eighty per cent.

A new technical publication of Rocol Ltd., entitled *Applications of Rocol Molybdenised Lubricants to Coal Mining and Associated Equipments*, lists the typical uses of Rocol molybdenised lubricants under the arduous conditions of mining.

Rocol anti-scuffing paste, which has the widest usage as an assembly and anti-seize lubricant, will overcome the difficulties of stripping down units which have been in service under conditions of wet and dust. These include loader bar picks, all assembly screws and nuts, valves, splines and keyed shafts. When Rocol anti-scuffing oil is added to existing lubricating oils, overheating, wear and seizure in trouble spots, such as

overloaded gear boxes and hot ring oil bath bearings, are eliminated.

The high temperature, water repellent Rocol Molytone greases combat wear and seizure under starved or other arduous lubrication conditions as experienced with pit prop pivots and certain types of conveyor and motor bearings. Where conventional lubricants cannot be employed, because they would become contaminated with coal dust to form abrasive pastes, such as with conveyor chains and sprockets and chain slides, the dry lubricant Rocol Molytox Plus solves the problems.

The Rocol Information Publication gives the recommended detailed part applications to all makes of colliery machines and equipment.

A new range of low cost eddy current coupling adjustable speed drives rated from 5 to 100 h.p. has been made available by U.S. International General Electric. Developed after more than four years of laboratory and field testing, the new drive makes use of significant advances in engineering design. It features an unusually compact drive unit, versatile performance, automatic control and sharply reduced maintenance.

Trademarked by General Electric as Kinatrol, the drive has a broad range of applications in many industries, including mining. The Kinatrol drive offers versatile performance over a constant-torque speed range. Ratings through 20 h.p. are capable of continuous operation down to 100 r.p.m. at rated torque, providing a speed range of approximately 17 to 1.

Shown below is a Holman Rotair compressor in use at the U.K. Atomic Energy Authority's site at Kit Hill, near Callington, Cornwall, for underground explosion tests with conventional explosives in a disused tin and copper mine. The tests form an important part of the Authority's research into methods for detecting, by seismic means, underground nuclear explosions of any size. The Holman Rotair shown provides 600 c.f.m. of compressed air at 100 p.s.i. for rock drills and other pneumatic mining equipment which are being used for tunnelling and for cutting out special chambers and vaults, in which conventional explosive charges of approximately 30 lbs. are fired. The Rotair is the first British portable screw type rotary compressor.



BARROW HEPBURN & GALE

SUBSTANTIALLY IMPROVED RESULTS

The 39th annual general meeting of Barrow Hepburn & Gale Limited will be held on March 17 in London.

The following is an extract from the circulated statement of the chairman, Mr. George W. Odey, C.B.E.:

It is a matter of satisfaction to be able to report a substantial improvement in the trading results for the year. Nevertheless, these results have been achieved in spite of a very sharp increase in hide prices during the first half of the year, followed by an equally sharp decline in the last quarter. As a result, our overall results for the half year were most encouraging, but in the second half of the year we were faced with a drastic writing down of stock values, particularly in our heavy leather tanneries.

Commenting on the disastrous effect on the sole leather industry of the wild fluctuation in the price of hides, the chairman states: "Tanners had to decide either to hold for replacement value on their leather, go out of business, or face a heavy loss. In our own case we decided, as a first step, to close Grange Tannery, our heavy leather tannery in London. Grange Tannery has been entirely vacated and the whole property, which represents a valuable island site, has been offered for sale."

We now have three Tanneries for sale; Grange Tannery in London, the tannery previously occupied by Henry Hall & Sons at York, and Monarch Tannery at Denholme, West Yorkshire, which was occupied by James Bailey (Denholme) Ltd.

We have always had before us the possibility of a further reduction in the consumption of sole leather and with this in mind we decided some years ago to enter the upper leather industry. This policy has proved to be fully justified and, during 1959, in spite of the price fluctuation in hides and skins, we achieved a very gratifying measure of success.

New Lines of Production

After reviewing the Group's activities at home and overseas, the chairman states: "Our main disability in recent years has been the losses that we have incurred on the production of sole leather. Over the past five years it is safe to say that the consumption of sole leather has fallen by some 50 per cent. We have persevered in the sole leather industry in the hope that conditions would improve and as substantial firms decided to close that the overall position would become more healthy and remunerative. However, it is quite clear that the past twelve months, with the great increase in hide prices, has dealt a further blow to the sole leather industry and, as a result, the outlook for sole leather tanners is again extremely grim."

In these circumstances, we propose to make a drastic reduction in the quantity of sole leather that we produce, and to devote our attention to the production of other lines which are in no way directly connected with the sole leather industry. We propose to develop into new lines of production where the general standard of profitability would appear to be higher than has been obtainable in the tanning industry in recent years.

When we can see clearly the new lines of development which we can profitably pursue, we propose to go to the general public and raise more capital.

[Company News

Atlas Copco (Great Britain), have held the first of a series of training courses for sales representatives in the use and maintenance of their mining equipment. Practical instruction in dismantling, repair and assembly of rock drills and mine loaders, and lectures on theory are designed to enable those attending to give the best possible service to customers. Annual refresher courses are planned.

Mr. G. V. Sims, director of the Council of British Manufacturers of Petroleum Equipment, and managing director of British Oil Equipment Credits, recently travelled to Mexico to negotiate the extension of the present financing agreement with Petroleos Mexicanos (PEMEX). Firm orders for £2,500,000 have already been placed against extended credit to £3,500,000.

Lodge-Cottrell Ltd. have secured an order worth approximately £720,000 for the blast furnace gas cleaning plant at the Spencer Works, Newport, of Richard Thomas and Baldwins Ltd. This is the largest single order ever secured by the company and the plant, which is designed to operate at high gas pressure, will consist of gas cooling and scrubbing towers, followed by electrostatic precipitators, together with water clarifying plant and filtration and dust recovery plant. It will eventually deal with 20 million cu. ft. of gas per hr. at N.T.P.

Daniel Adamson and Co. have been awarded a further contract by the National Coal Board for three 6,000 cu. ft. per min. electrically driven centrifugal air compressors. This is a repeat order, valued at £120,000. The machines which are of the "Adamson/Escher-Wyss" type, are to be installed at Wolstanton Colliery, Stoke-on-Trent.

The Timber Development Association announce that as from February 25 the new address of their Midlands Regional Office will be: 55 Pershore St., Birmingham 5. Telephone MIDland 1079.

Publications Received

Year Book and Buyers' Guide, 1960 published by Rhodesian Mining and Engineering, Odhams Press, Rhodesia (PVT) contains an index of surveys, aerial photographs geological maps and publications on Southern Rhodesia; information on local prospecting areas and claim pegging procedure; mineral identification tables; metal and mineral market specifications, and comprehensive directories covering all aspects of mining in the country.

Research Highlights of the National Bureau of Standards, Annual Report 1959, National Bureau of Standards Miscellaneous Publication 229, 169 pages, 55 cents, plus 13.75 c. mailing costs outside the U.S. (Available Superintendent of Documents, U. S. Government Printing Office, Washington 25, D.C.).

This illustrated report brings together the most important developments in the research programme of the Bureau during 1959. It describes a wide range of scientific studies, laboratory experiments, and instrumentation developments.

Much of the material is concerned with the new technology of the space age.

Personal

Mr. R. N. Millar, a director of The General Electric Co., has been appointed managing director of the company's Engineering Group's works at Erith Witten. Mr. Millar will have overall responsibility for the whole of the company's activities in the heavy electrical, mechanical and nuclear engineering fields.

Mr. F. W. Tomlinson, managing director of Pyrotenax Ltd., Mr. J. M. Willey, director and general manager of Murex Welding Processes Ltd., and Mr. P. S. Bryant of Murex Ltd., have been appointed to the board of Murex Ltd., Rainham. Mr. Tomlinson has also been appointed to the board of Murex Welding Processes Ltd.

F. Perkins, Ltd., announce that Mr. K. E. Woollatt has been appointed director of overseas manufacturing operations.

The National Coal Board announce that Mr. Henry Donaldson has been appointed senior press officer. He will take charge of their Press Office in succession to Mr. Geoffrey Kirk who has been appointed chief public relations officer.

Mr. R. A. Gorges has been appointed Principal of the Camborne School of Metalliferous Mining. Mr. Gorges, who is a son of Sir Howard Gorges is at present on the staff of the Anglo American Corporation of South Africa.

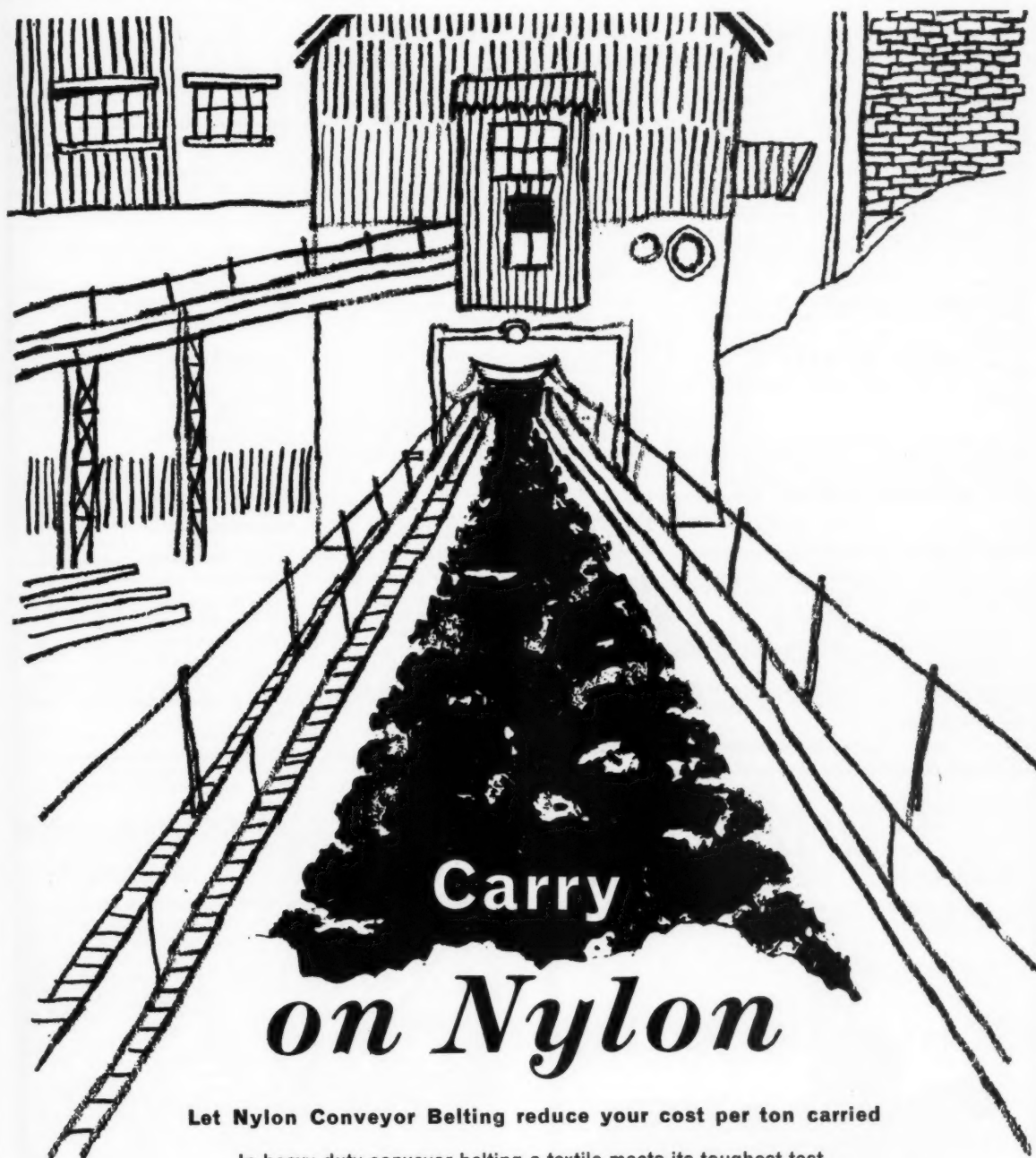
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The successful applicant would be required to work in close conjunction with visiting mining consultants but otherwise would be in sole charge of the development and running of the mine. Academic or practical qualifications must be acceptable to the Government Mines Department and some practical underground experience is essential. More important, however, is that the applicant should have a flair for installing and maintaining the Diesel driven generators and compressors which will be required at the mine and also that the prospect of opening up a new mine in a new area, commencing from scratch and having to train raw labour to do the work, should be attractive to him.

A person in his late thirties or early forties would be preferred but age is not as important as the other qualifications."

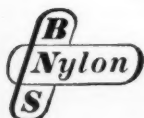
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Coming Events

The 1960 Metal Mining and Industrial Minerals Convention and Exposition of the American Mining Congress is to be held this year at Las Vegas, Nevada, on October 10-13, under the direction of Mr. John C. Kinnear, Jr., general manager of the Nevada Mines Division, Kennecott Copper Corporation. Mr. Oscar A. Glaeser, vice-president and general manager, Western Operations, U.S. Smelting Refining and Mining Co., is national chairman of the programme committee, and as in the past, the programme will cover a broad range of topics, including national policies as they affect mining as well as the latest developments in mine and mill operating practices. A concurrent exposition of mining equipment and supplies will be held in the new Las Vegas Convention Centre.

★

The 32nd Annual Meeting of the Lead Industries Association will be held on April 6 and 7, 1960, at the Chase-Park Plaza Hotels in St. Louis, Mo., U.S.A.

★

The Institution of Mining and Metallurgy will hold its Annual Dinner in the Hall of Goldsmiths' Company, London, on May 5, 1959.

★

Manchester Geological and Mining Society: Lecture entitled "Gas-cooled nuclear reactors" by Dr. G. Brown, at Wigan Mining and Technical College, March 10, 4 p.m.

A series of technical meetings has been arranged by a Committee convened by the Institute of Fuel, to be held in London at Olympia on the afternoons of May 2 and 3, 1960. The papers and discussions are under the general title "The Selection of Fuel-using Equipment and Power Plant." The meetings are admission free, and advance copies of the papers, and tickets for admission can be obtained on request from the Institute of Fuel.

MILL FOREMAN required for Mine in CYPRUS. Must have experience of Copper Sulphide flotation plant. Tours of two years with three months' leave on full pay. Provident Fund. Salary according to qualifications and experience. Write giving full particulars of experience to Box MJ. 793 c/o 191 Gresham House, E.C.2.

The Proprietors of British Patent No. 718,352 for "IMPROVEMENTS IN OR RELATING TO BARS FOR SUPPORTING MINE ROOFS OR THE LIKE," desire to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder. Further particulars may be obtained from Marks & Clerk, 57 & 58 Lincoln's Inn Fields, London W.C.2.

The Measurement and Control Section of The Institution of Electrical Engineers, in association with the British National Committee of Non-Destructive Testing in Electrical Engineering is making arrangements for a Conference on Non-Destructive Testing in Electrical Engineering, to be held at the Institution from November 8-10, 1961.

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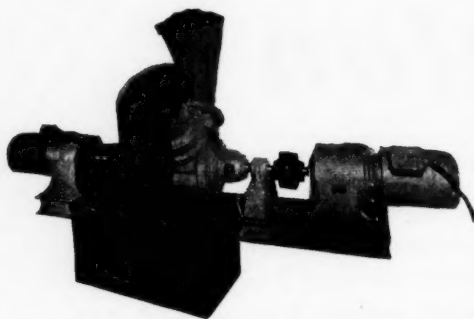
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METAL PRICES

Aluminium, 99.5%, £186 per ton	Manganese Metal (96%/98%) £275/£285
Antimony—	Magnesium, 2s. 2½d./2s. 3d. lb.
English (99%) delivered, 10 cwt. and over £190 per ton	Nickel, 99.5% (home trade) £600 per ton
Arsenic, £400 per ton	Osmium, £21/£23 oz. nom.
Bismuth (min. 1 ton lots) 16s. lb. nom.	Osmiridium, nom.
Cadmium 10s. 0d. lb.	Palladium, imported, £9
Cerium (99%) net, £16 0s. lb. delivered U.K.	Platinum U.K. and Empire Refined £30 5s.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.	Imported £28½/29½
Cobalt, 14s. lb.	Quicksilver, £70½/£71½ ex-warehouse
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram	Rhodium, £50 oz.
Gold, 250s. 3½d.	Ruthenium, £18/£20 oz. nom.
Iridium, £23/£25 oz. nom.	Selenium, 50s. 0d. per lb.
Lanthanum (98%/99%) 15s. per gram.	Silver, 79½d. f. oz. spot and 79½d. f'd
	Tellurium, 21s. 6d. lb.

ORES AND OXIDES

Antimony Ore (60%) basis	19s. 6d./21s. 6d. per unit, c.i.f.
Beryl (min. 10 per cent BeO)	230s. per l. ton unit BeO
Bismuth	30% 5s. 0d. lb. c.i.f.
	20% 3s. 3d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semifriable 48%) (Ratio 3 : 1)	£15 15s. 0d. per ton c.i.f.
.. Hard Lumpy 45% (Ratio 3 : 1)	£15 10s. 0d. per ton c.i.f.
.. Refractory 40%	£11 0s. 0d. per ton c.i.f.
.. Smalls 44% (Ratio 3 : 1)	£14 0s. 0d. per ton c.i.f.
Baluchistan 48% (Ratio 3 : 1)	£11 15s. 0d. per ton f.o.b.
Columbite, Nigerian quality, basis 70% combined pentoxides (Ratio 10 : 1)	
	Nb ₂ O ₅ : Ta ₂ O ₅ 175s. per l. ton unit c.i.f.
Fluorspar—	
Acid Grade, Flotated Material	£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF ₂)	156s. 0d. ex. works
Lithium Ore—	
Petalite min. 31% Li ₂ O	40s. 0d./45s. 0d. per unit f.o.b. Beira
Lepidolite min. 31% Li ₂ O	40s. 0d./45s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li ₂ O	£25 0s. per ton f.o.b. Beira
Magnesite, ground calcined	£28 0s./£30 0s. d/d
Magnesite Raw (ground)	£21 0s./£23 0s. d/d
Manganese Ore Indian—	
Europe (46%-48%) basis 67s. 6d. freight	73d./75d. c.i.f. nom.
Manganese Ore (43%-45%)	69d./71d. c.i.f. nom.
Manganese Ore (38%-40%)	nom.
Molybdenite (85%) basis	8s. 11d. per lb. (f.o.b.)
Titanium Ore—	
Rutile 95/97% TiO ₂ (prompt delivery)	£28 10s. 0d. per ton c.i.f. Aust'n.
Ilmenite 52/54% TiO ₂	£11 10s. per ton c.i.f. Malayan
Wollfram and Scheelite (65%)	155s. 0d./161s. 0d. per unit c.i.f.
Vanadium—	
Fused oxide 95% V ₂ O ₅	8s./8s. 11d. per lb. V ₂ O ₅ c.i.f.
Zircon Sand (Australian) 65-66% ZrO ₂	£16/£16 10s. ton c.i.f.

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